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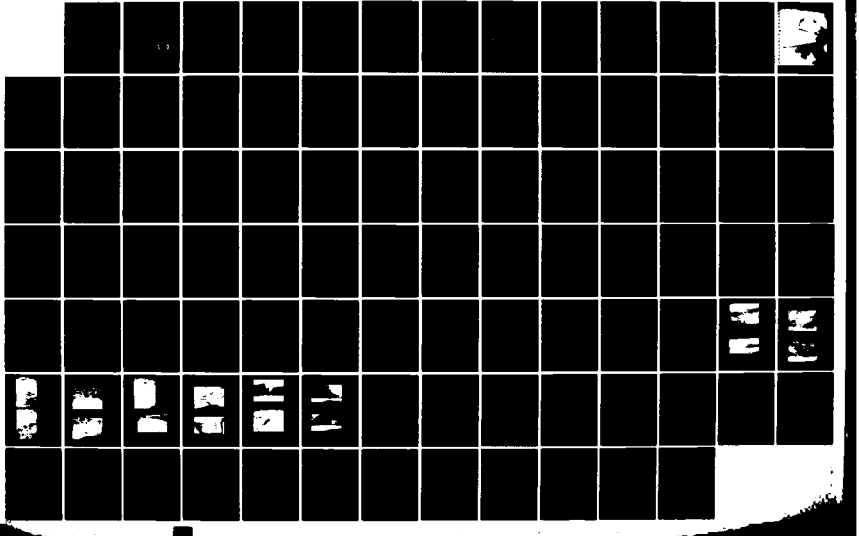

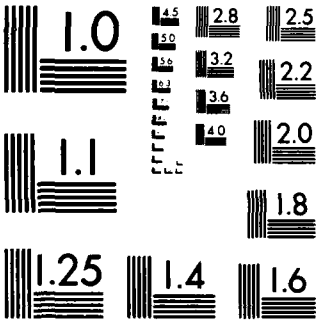

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(2)

CONNECTICUT RIVER BASIN

WHATELY, MASSACHUSETTS

NORTHAMPTON RESERVOIR
(UPPER DAM)
MA 00521

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

AUGUST 1978

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Whately, Massachusetts
West Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam is a 940 ft. long earth embankment dam with a concrete spillway. The visual inspection did not disclose any findings that indicate an immediate unsafe condition. It is recommended that the areas of erosion both on the upstream and downstream faces where the abutments and embankment interface be repaired. Surface water in these areas should be redirected to prevent future erosion.

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REPLY TO
ATTENTION OF:

NEDED

Honorable Michael S. Dukakis
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor Dukakis:

I am forwarding to you a copy of the Northampton Reservoir (Upper Dam) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, the City of Northampton, c/o Board of Public Works - Water Division, 237 Prospect Street, Northampton, Massachusetts 01060.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA. 00521

Name of Dam: Northampton Reservoir (Upper Dam)

Town: Whately

County and State: Franklin County, Massachusetts

Stream: West Brook

Date of Inspection: May 25, 1978

This dam is a 940 foot long earth embankment dam with a concrete spillway. The dam was designed in the mid 1960's and Constructed in 1970. The engineering data made available were a set of construction drawings and specifications. These were furnished by the City of Northampton, owners of the dam.

The visual inspection did not disclose any findings that indicate an immediate unsafe condition. Based on size and hazard classification in accordance with Corps guidelines, the test flood is the Probable Maximum Flood. However, the dam's spillway will not pass the PMF without overtopping.

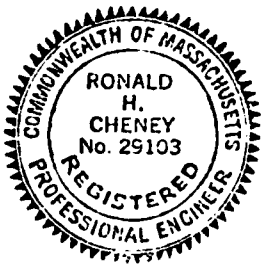
It is recommended that the areas of erosion both on the upstream and downstream faces where the abutments and embankment interface be repaired. Surface water in these areas should be redirected to prevent future erosion. The riprap on the upstream face should be extended to the dam's crest. The water exiting from the toe and core wall drains should be directed to a control channel and weir where the flow can be periodically measured. This dam has a thin concrete core wall and, although the dam is in earthquake zone 2 and not normally requiring earthquake evaluation

the effects of earthquake shaking on the integrity of the core wall should be investigated.

The 20" capped pipe running beneath the dam to the downstream toe should be uncapped and extended to the lower reservoir. This will prevent the potential of a pressurized pipe (should the outlet gate be left open) from bursting and undermining the dam.

Although the spillway can not discharge the test flood without overtopping the dam, the spillway capacity is comparatively large. Because of the hydrologic and safety relationships between this dam and the lower reservoir, it is necessary that future hydrologic studies concerning spillway capacities at either project should simultaneously encompass studies for both projects.

These recommendations are not of an urgent nature but should be implemented within a period of 2 to 4 years.



Ronald H. Cheney

Ronald H. Cheney, P.E.
Associate

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

This Phase I Inspection Report on Northampton Reservoir (Upper Dam) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Charles G. Tiersch

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

Fred J. Ravens Jr

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

SEP 15 1978

PREFACE

This report is prepared under guidance contained in Department of the Army, Office of the Chief of Engineers, Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external

conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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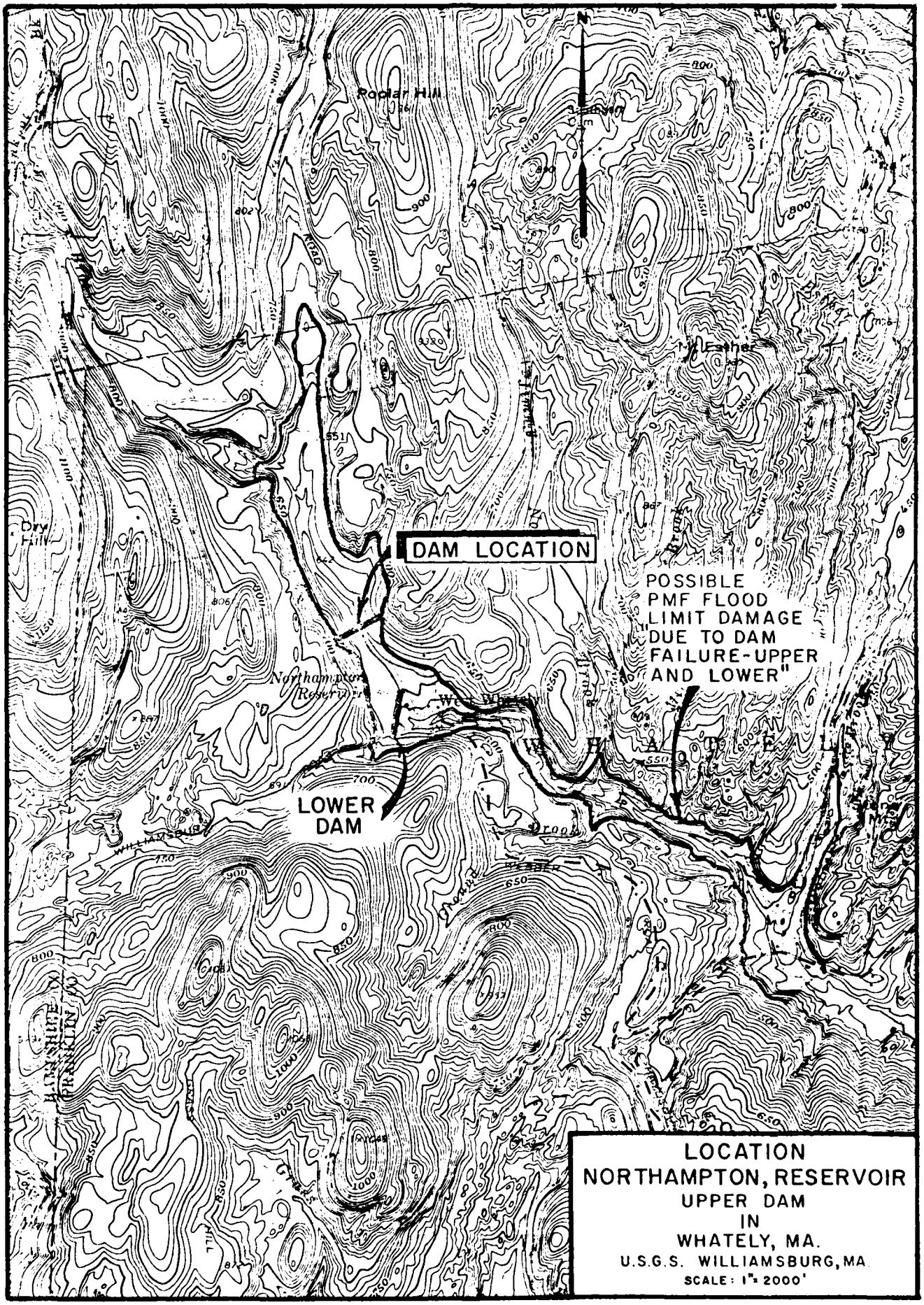

DAM LOCATION
POSSIBLE PMF FLOOD LIMIT DAMAGE DUE TO DAM FAILURE-UPPER AND LOWER"
LOWER DAM
Poplar Hill
Dry Hill
Northampton Reservoir
West Whately
Mt Esther
Mt Toby
Roaring Brook
Whately
Williamsburg
Hampshire
Franklin
LOCATION
NORTHAMPTON, RESERVOIR
UPPER DAM
IN
WHATELY, MA.
U.S.G.S. WILLIAMSBURG, MA
SCALE: 1" = 2000'

PHASE I
NATIONAL DAM INSPECTION PROGRAM
NORTHAMPTON RESERVOIR (UPPER DAM)

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority.

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Hayden, Harding & Buchanan, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Hayden, Harding & Buchanan, Inc. under a letter of May 3, 1978, from Mr. Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0307 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

Section 1.1 Continued

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

Northampton Reservoir Upper Dam is located in the Town of Whately in Franklin County, Massachusetts, just upstream of Northampton Reservoir Lower Dam.

b. Dam and Appurtenances

The dam is a 940' long, 80' high earth embankment structure having a riprap upstream face sloping at 2:1 and a turf covered downstream face sloping at 2:1. Located within the center of the dam is a 2' wide concrete core wall. The top of the dam embankment section has a width of 20 feet. Located adjacent to the embankment on the eastern side is a 66' wide 35' high concrete spillway, having a vertical upstream face and downstream face sloping at approximately 3:4. Located within the upstream embankment approximately 70' north of the top of the dike is a gate structure. This structure has a 20" diameter low level intake pipe and two intermediate level intake gates. Two 20" diameter D.I. pipes exit from the bottom. One pipe empties into the lower reservoir directly below this site. The other pipe is capped just beyond the toe of the dam.

Section 1.2 Continued

c. Classification

The dam can be classified by size as intermediate due to its hydraulic height of 80 feet and its storage capacity of 2865 a.f.

d. Hazard Classification

The dam has a high hazard potential for loss of life should a complete failure occur. Approximately 15 habitable structures could be damaged by the dam's failure.

e. Ownership

The dam is owned by the City of Northampton and has always been part of their water supply system.

f. Operation

The dam is maintained and operated by the Board of Public Works - Water Division located at 237 Prospect Street, Northampton, Massachusetts. Mr. Leon Murray is the Superintendent of the Water Division (tel. 413-584-1401).

g. Purpose of Dam

The dam's purpose is water supply. Water is drawn into the intake structure flowing through the 20" diameter D.I. discharge pipe and empties into the lower reservoir directly below the dam.

h. Design and Construction History

The dam was designed by the engineering firm of Whitman & Howard, Inc., Wellesley, Massachusetts. The construction was completed in 1970 and no major repair program has been instituted since its completion.

1.3 Pertinent Data

a. Drainage Area

Drainage Area (2897 acres - 4.52 s.m.) is comprised of wooded, rolling hills, containing several drainage paths. The main drainage path is the Avery Brook. It's length is 3.6 miles and has a drop in elevation of 550 feet. Steep changes in the brooks elevation are intercepted by "flat" areas in several locations.

There are very few homes within the area and roads appear to be unimproved dirt roads.

Below the dam is the area known as West Whately. There are several buildings and homes located within 1000 feet of the dam. These buildings are located within 400' of the discharge stream known as West Brook. The brook flows for about a mile before any buildings come within 200 feet of the stream bed. Beyond that, development is scattered and not close to the brook.

b. Discharge at Dam Site

This dam has two 20 inch diameter D.I. pipes exiting from the intake structure at Inv. El. 624.17. One pipe discharges directly into the lower reservoir. The other pipe is capped just below the toe of the dam. Other than the active 20 inch pipe there is no other means of dewatering this site.

The dam was constucted in 1970 and no record of maximum impoundment or spillway discharge is known. Area residents have witnessed flows of approximately 12 to 18 inches maximum above the spillway crest.

Section 1.3 Continued

The spillway is ungated and has an approximate capacity of 3320 c.f.s. (735 c.s.m.) at elevation 680.5.

c. Elevation (ft. above MSL)

(1) PMF surcharge - 681.0

(2) Top Dam - 680.5

(3) Water Supply Pool - varies 675.0

(4) Spillway crest (gated)-nongated 675.0

(5) Upstream portal invert diversion tunnel- no diversion tunnel

(6) Streambed at centerline of dam-600.±

(7) Maximum tailwater-flows through spillway channel directly into lower reservoir elev. 601.±

d. Reservoir

(1) Length of Water Supply Pool - 4000'±

(2) Length of PMF Pool - 5000'

e. Storage (acre-feet)

(1) Water Supply Pool - 2460

(2) Top of Dam - 2820

(3) PMF Surcharge - 4367

f. Reservoir Surface (acres)

(1) Water Supply Pool - 79

(2) Top Dam - 90

(3) PMF Pool - 91

Section 1.3 Continued

g. Dam

(1) Type-Gravity straight earth embankment

(2) Length-940'

(3) Height-90' (structural includes cutoff)

(4) Top Width-20'

(5) Side Slopes-2:1 riprap U.S., 2:1 turfed D.S.

(6) Zoning -none

(7) Impervious Core -Concrete Wall

(8) Cutoff -Core wall set on rock and till.

(9) Grout curtain -none

i. Spillway

(1) Type -Broad crest, concrete ogee

(2) Length of weir-66'

(3) Crest elevation-675.0

(4) Gates -none

(5) U/S Channel -none

(6) D/S Channel -Concrete paved for 60'

j. Regulating Outlets

The regulating outlets for this facility consists of the two 20" dia. D.I. outlet pipes from the intake structure. As described previously only one of these pipes is active, the other being capped. The active pipe flows directly into the lower reservoir. The Inv. elevation for both of these pipes is 624.17.

Section 1.3 Continued

The intakes consist of a lower level 20" dia. D.I. pipe at Inv. El. 629.17 and two 16" dia wall openings at Inv. Elevations 649.33 and 664.33.

All of the intakes and outlets are controlled by their own manually operated gate.

The intake structure is a reinforced concrete tower with inside dimensions of 7'-0" X 6'-0". It is founded on ledge at elevation 620.0± and the top slab is at elevation 680.0.

SECTION 2
ENGINEERING DATA

2.1 Design

This dam was designed by the Engineering firm of Whitman and Howard, Wellesly, Ma. The Construction drawings are dated 1965 with additional test borings added in 1969.

A complete set of construction drawings and Specifications was furnished by the City of Northampton. Hydraulic and Stability Calculations have been requested of Whitman and Howard. However, they are having difficulty locating these in their files and as of the date of this report have not been found.

2.2 Construction

Construction was completed in 1970 and as far as is known the in place dam is in agreement with the Contract drawings.

2.3 Operation

There are no formal records of operational procedures for this dam. The Caretaker and Superintendent of the water division indicated that no major problems have occured since the dam has been put into operation.

2.4 Evaluation

a. Availability

Construction drawings and Specifications were made available by the City. Hydraulic calculations have not been found as of this date.

Section 2.4 Continued

b. Adequacy

It is felt that the construction drawings and the specifications are adequate for a Phase I report regarding structural stability. The original hydraulic and stability calculations along with any original soils reports have not been found as of the date of this report. Therefore the adequacy of this dam must be based on the limited data supplied along with the visual inspection and hydrologic and hydraulic assumptions.

c. Validity

The visual inspection of this facility showed no reason to question the validity of the information supplied. The possible exception is with the top of the riprap referred to later in this report.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General

The phase I inspection of this dam was made on May 25, 1978. The water in the reservoir was running over the Spillway approximately one inch. All Items on the upstream slope including the slope were therefore inspected from the water surface elevation up.

b. Dam

Visual inspection of the embankment showed no signs of distress.

Upstream Slope

Only the upper 6 ft. of the U.S. slope was visible at the time of inspection. The upstream slope has been protected with riprap which is in good condition. The riprap protection stops about 3 ft. below the crest of the dam. (See photo #3*) Design drawings indicate that the riprap should have been carried to the crest elevation of 680.00 ft. It is not known if the crest elevation has been raised or the riprap stopped at a lower elevation than intended. Design drawings indicate full reservoir elevation at 675.0 which would mean about two feet of protected freeboard exists under full reservoir height. There is no sign of erosion above the top of the riprap and this condition does not pose an immediate safety hazard to the dam at this time, however, it is recommended that additional riprap be added to protect the entire upstream slope to the crest.

*See Appendix C for this and all subsequent photos.

Section 3.1 Continued

There has been erosion of the contact of the upstream slope of the dam and the left abutment due to surface water runoff. (See photo 1 .) This condition does not pose an immediate threat to the safety of the dam, but provisions should be made to collect surface runoff and prevent continued erosion.

Crest

The crest of the dam has no pavement. No evidence of erosion or cracking of the embankment was observed. The abutment of the service bridge appeared to be in good alignment.

Downstream Slope

The face of the downstream slope was traversed along four lines, (1) along the crest, (2) at approximate elevation 665.0, (3) along the berm (elev. 640.0) and (4) along the toe.

The slope is in good condition with an excellent turf and grass cover. There were occasional rodent holes in the surface.

No seepage or damp areas were observed along the toe.

There is an area of minor surface sloughing 40 feet left of the left spillway wing wall. (See photo 4). The area is approximately 18 ft. square with its upper boundary at the intersection of the crest and the slope. The topography within this area is hummocky with reliefs of about 2 ft.

There is a surface erosion channel at the contact of the left abutment and the downstream slope. The lower end of this erosion channel which intersect the left spillway wall, has been filled with rock cleaned out of the spillway apron in an effort

to minimize further erosion. In some areas the erosion is quite deep as can be seen in photo 6 . This surface erosion is not an immediate threat to the safety of the dam but it is recommended that this condition be corrected soon.

Similar erosion has occureed on the right abutment at the embankment contact. This erosion is not as severe as on the left abutment but maintenance measures should be taken to eliminate this surface erosion.

A 6" diameter toe drain was installed in the downstream slope. Two drain pipes, one leading from each abutment exit into the area of the original brook channel. Both of these drains are flowing small amounts of clear water. The drain from the right abutment is shown in photo 9 .

A third drain exits into the old brook channel at the dam toe. This drain leads from a horizontal drain along the base of the concrete core wall. This drain which is submerged is flowing a large amount of clear water. Disturbance to the surface of the pool into which this drain discharges is shown in photo 9. It is recommended that a control channel and weir be constructed to permit measurement of seepage from the three drain pipes.

c. Appurtenant Structures

The intake structure was inspected above the water surface. The concrete was found to be in good condition with no cracks, spalls or rusted reinforcement evident. The service bridge of steel trusses and galvanized grating was found to be

Section 3.1 Continued

in good condition with only minor rust showing.

The spillway with its concrete walls and concrete paved outlet channel is in good condition. The channel walls do have som shrinkage and temperature cracks at approximate mid points between construction joints. With the exception of one joint which appears to have been constructed out of alignment by approximately one inch, all joints are in align. Some minor spalls exist at the expansion joints. The pavement of the outlet channel is good with only minor areas of surface erosion (1" max. depth).

The spillway has one large spall approximately triangular in shape 5 feet long and 10 inches wide at is base. This spall is 0" deep at its apex and 2"± deep at its base. The spall is located at the base of the spillway approximately 4 ft. off the ℄. Also where the upstream walls abut the spillway proper, there are cracks and spalls. These are the same cracks referred to in the state's inspection reports. The plans tend to confirm that this is properly caused by the spillway extending to rock while the walls are placed on soil foundation well above the rock. These cracks are shown in photo no. 13 .

d. Reservoir Area

The reservoir area consists of wooded rolling hills. An indepth description of the drainage area is given in section 1.3a of this report. The amount of silation within the reservoir is unknown.

Section 3.1 Continued

e. Downstream Channel

Three recent landslides have occurred in the spillway discharge channel. These landslides are shown in photos 7 and 8. They present no immediate safety hazard to the dam but should be repaired soon to prevent continued erosion and further landsliding.

3.2 Evaluation

Visual examination indicates no immediate safety problems, however, erosion at the abutment/embankment contact areas due to surface water runoff should be stopped by redirecting the runoff or providing a suitably designed drainage way.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

The water from this reservoir is used to supply the City of Northampton. The normal operating procedure is with the gate on the 20" dia. pipe which feeds water to the lower reservoir open allowing water to flow into the lower reservoir.

4.2 Maintenance of Dam

The City normally cuts the down stream slope once a year and inspects for animal burrows, filling those holes which are found.

4.3 Maintenance of Operating Facility

All manually operated gates for the intake structure and the outlet pipes are operated once a year by the City.

4.4 Description of Warning Systems

There are no warning systems associated with this dam.

4.5 Evaluation

The normal procedure of cutting turf and operating all the gates at least once a year appears adequate for this facility. This dam, however, should be inspected yearly by qualified personnel who can identify any areas of concern which could in time lead to serious deficiencies.

SECTION 5
HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

As of this report, the hydraulic computations for this dam have not been provided. Therefore the required test flood was developed as noted in "d" below.

b. Experience Data

Maximum impoundments and spillway flows for this dam are unknown. Residents of the area indicate the maximum height of water observed over the spillway to be 12 to 18 inches.

c. Visual Observations

Visual observations of the drainage area and general vicinity of the dam show them to be in general agreement with area U.S.G.S. map. Description of the drainage areas is given in Section 1.3 of this report.

d. Overtopping Potential

This dam carries an intermediate classification for size with a high hazard potential and as such should be capable of passing a PMF. This test flood was computed by determining the watershed drainage area from USGS maps in combination with Corps discharge guide curves. A PMF inflow of 8500 cfs was developed and results in a discharge of 7550 cfs. This discharge would result in the dam being overtopped by about 0.5 ft. (El. 681). With the reservoir level at 680.5, the spillway discharge is 3320 cfs (735 csm), which is equivalent to about a ½ PMF.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The visual inspection did not disclose any apparent stability problems.

b. Design and Construction Data

Design drawings and construction specifications exist and indicate that the dam is a homogeneous embankment consisting of "compacted pervious fill" with a concrete core wall. The embankment is founded on glacial till with a cut-off trench extending into the till on the right and to bedrock on the left side of the dam. The concrete core wall extends to the base of the cut-off trench. Both the upstream and downstream slopes of the embankment were designed on a 2H to 1V slope. A 10 ft wide berm exists 12 ft above the toe on the downstream and upstream slopes.

c. Operating Records

No operating records were made available.

d. Post-construction Changes

There are no known post-construction changes to the dam embankment.

e. Seismic Stability

The dam is located in Seismic Zone 2 according to U.S. Corps of Engineers guidelines and normally it would be assumed that there is no hazard from earthquake loading provided

Section 6.1 Continued

static stability conditions are satisfactory and conventional safety margins exist. However, because the dam relies on a thin concrete core wall as a water barrier and the embankment is a homogeneous pervious fill, it is recommended that the owner engage a knowledgeable consulting engineer to evaluate the possibility of the occurance of damage to the core wall during earthquake shaking.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Conditions

The visual inspection did not disclose any findings that indicate an immediate unsafe condition.

b. Adequacy

The information available is such that a Phase I level investigation can be performed adequately.

c. Urgency

The recommendations presented in Sections 7.2 and 7.3 should be implemented by the owner within two to four years.

d. Necessity of Additional Investigations

The findings of the visual inspection do not warrant an additional investigation.

7.2 Recommendations

The owner should engage a qualified consultant to evaluate the effect of earthquake shaking on the integrity of the concrete core wall.

7.3 Remedial Measures

Although this dam is basically in good condition it is considered important that the following items be accomplished.

a. Alternatives

It is recognized that the dam will not pass the test flood without overtopping the dam. The spillway capacity is

comparatively large, however, because it could discharge a flood equivalent to a ½ PMF. Because of the hydrologic and safety relationships between the upper and lower water supply reservoirs, it is necessary that future hydrologic studies concerning spillway capacities at either project simultaneously encompass studies for both projects. Refer to the Northampton Reservoir Lower Dam, MA. 00520, Phase I Inspection Report.

b. Operation and Maintenance Procedures

(1) Repair surface erosion channels at abutment/embankment contacts upstream and downstream.

(2) Redirect and collect surface water along abutments to prevent further erosion.

(3) Riprap should be added to the upstream slope above the existing riprap to the crest elevation.

(4) A control channel and weir should be constructed to permit periodic measurement of flow from the three drainage pipes in the embankment.

(5) The 20 inch diameter capped pipe extending beyond the toe of the dam should be uncapped and extended to the lower reservoir. In lieu of extending the pipe, an adequately designed and riprapped channel could be provided. As it now stands, this pipe could be surcharged by a 50 foot head if the outlet gate at the intake structure is opened. Should the pipe

burst while under this 50 foot head, serious undermining of the dam could ensue.

(6) This dam should be inspected annually by qualified personnel who can identify areas of concern which could, in time, lead to serious deficiencies.

(7) Around the clock surveillance should be provided during periods of unusually heavy precipitation. In addition, the owner should develop a formal system for warning downstream residents in case of emergency.

APPENDIX A

VISUAL INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Northhampton Wately Complex
Upper Dam

DATE May 25, 1978

TIME 10:30 am

WEATHER Cloudy 62°F

W.S. ELEV. 675.1 U.S. ____ DN.S.

PARTY:

1. Ron Cheney
2. Dan LaGatta
3. Craig Nehring
4. ____
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Embankment Dam	Dan LaGatta	
2.	Outlet Channel	Dan LaGatta	
3.	Intake Structure & Control Structure	Ron Cheney	
4.	Spillway	Ron Cheney	
5.	Service Bridge	Ron Cheney	
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Wately Complex DATE May 25, 1978

PROJECT FEATURE Upper Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	680.5
Current Pool Elevation	One inch above spillway crest
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	No pavement
Movement or Settlement of Crest	None observed
Lateral Movement	None observed
Vertical Alignment	No misalignment observed
Horizontal Alignment	No misalignment observed
Condition at Abutment and at Concrete Structures	Left abutment has surface water erosion on upstream side
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	None observed
Sloughing or Erosion of Slopes or Abutments	Left abutment has surface erosion at upstream and downstream contact with embankment
Rock Slope Protection - Riprap Failures	No failures observed
Unusual Movement or Cracking at or near Toes	None observed
Unusual Embankment or Downstream Seepage	None observed
Piping or Boils	None observed
Foundation Drainage Features	Downstream toe near right abutment
Toe Drains	None observed
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Wately Complex DATE May 25, 1978

PROJECT FEATURE Upper Dam NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney
Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	This facility has no approach channel.
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	Good
Stop Logs and Slots	None

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Wately Complex DATE May 25, 1978

PROJECT FEATURE Upper Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - CONTROL TOWER	Control tower and intake structure are one and the same
a. Concrete and Structural	
General Condition	Good
Condition of Joints	Good
Spalling	None observed
Visible Reinforcing	None observed
Rusting or Staining of Concrete	None observed
Any Seepage or Efflorescence	None observed
Joint Alignment	No misalignment observed
Unusual Seepage or Leaks in Gate Chamber	
Cracks	None observed
Rusting or Corrosion of Steel	None observed
b. Mechanical and Electrical	All gates are manually operated.
Air Vents	City checks gates for operational ability once a year.
Float Wells	
Crane Hoist	Only operational outlet is 20" dia. D.I. pipe which flows into lower reservoir.
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Wately Complex DATE May 25, 1978

PROJECT FEATURE Upper Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - TRANSITION AND CONDUIT	There is no transition and conduit.
General Condition of Concrete	20" dia. D.I. pipe outlet only.
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Wately Complex DATE May 25, 1978

PROJECT FEATURE Upper Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	No outlet structure.
General Condition of Concrete	Pipe discharges directly into lower reservoir.
Rust or Staining	Stone varying in size from 4" to 2'± covers end of pipe.
Spalling	Most of pipe outlet is actually covered.
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain Holes	
Channel	
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	See Section 3.1 of Report for description of three slides along channel walls.

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Wately Complex DATE May 25, 1978

PROJECT FEATURE Upper Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	This facility has no approach channel.
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	Good
Rust or Staining	None observed
Spalling	*Small area base of spillway off center line.
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	Small amount at joints.
Drain Holes	None
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Rock strewn
Other Obstructions	None
	*Some spalling at joints where upstream walls abut spillway.

PERIODIC INSPECTION CHECK LIST

PROJECT Northampton Wately Complex DATE May 25, 1978

PROJECT FEATURE Upper Dam NAME D.P. LaGatta

DISCIPLINE Geotechnical Engineer NAME R.H. Cheney

Structural Engineer

AREA EVALUATED	CONDITIONS
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	
Bearings	Good
Anchor Bolts	Good
Bridge Seat	Good
Longitudinal Members	Good
Under Side of Deck	Galv. grating - good
Secondary Bracing	Good
Deck	Galv. grating - good
Drainage System	
Railings	Painted steel - good
Expansion Joints	None - slotted holes in bearings
Paint	Some rust - not serious at this time
b. Abutment and Piers	
General Condition of Concrete	Good
Alignment of Abutment	Good
Approach to Bridge	None
Condition of Seat and Backwall	One spalled area approximately 6" long in backwall.

APPENDIX B

1. LIST OF DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS

2. PAST INSPECTION REPORTS

3. PLANS AND DETAILS

LIST OF AVAILABLE ENGINEERING DATA

1) Set of Construction Drawings.

2) Set of Construction Specifications.
Location: City of Northampton, Board of Public Works Water Division. 237 Prospect Street, Northampton, Massachusetts.

3) Construction Drawings are also on Micro-film at the Engineering office of Whitman & Howard. 45 Williams Street, Wellesly, Massachusetts.

To this point in time, Whitman & Howard has not been able to find design calculations.

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

C ty of Northampton
Board of Public Works
W ter Division
2 7 Prospect Street
Northampton, Ma.
ATTN: Mr. Leon Murray

February 25, 1977

Re: Inspection Dam #2-6-337-3
Northampton's West Whately Reservoir
Upper Dam
Whately, Ma.

Dear Sir:

On May 26, 1976, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be the City of Northampton. If this information is incorrect will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 705 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

See "Remarks & Recommendations" on reverse side

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,

John J. Hannon, P.E.
Chief Engineer

AMc:
cc: Francis J. Hoey
Russell Salls
File

REMARKS AND RECOMMENDATIONS

DAM #2-6-337-3
MAY 26, 1976

Several animal burrows were noted in the downstream slope and toe of slope. Ero-
ic of spillway channel bed at lower end of outlet is becoming more noticeable.
bi area is rough paved with boulders which are becoming misplaced by water action
at do not appear to pose any problem to safety of dam at present.

The settlement cracks between wingwalls and abutment walls of overflow spillway
oted in last inspection have been repaired as has the face of spillway dropwall.
he wingwalls appear to have stabilized now and only hairline cracks were noted.

Considerable seepage flows were noted in the stone paving or riprap along toe of dam
ut how much of this is surface storm water draining off was difficult to determine.
he seepage drainpipe outletting on the westerly toe of slope had a strong flow of
at r emerging and a small amount of fine deposits were noted in brook bed directly
elow outlet end of pipe.

It would seem advisable for the Water Department to maintain a log of this seepage
low as a reference check for any possible unwarranted future increase in flow which
ould be indicative of a problem in the dam's structure.

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

City/Town Whately. County Franklin. Dam No. 2-6-337-3

Name of Dam Northampton's West Whately Reservoir - Upper.

Topo Sheet No. 11A. Coordinates: N 527,600 (Mass. Rect.), E 279,900.

Inspected by: Harold T. Shumway, On May 26, 1976. Date Last Inspection 11/29/73

2. OWNER/S: As of May 26, 1976

per: Assessors ____, Reg. of Deeds ____, Prev. Insp. X, Per. Contact X.

	Name	St. & No.	City/Town	State	Tel. No.
1.	City of Northampton Board of Public Works, Water Division	237 Prospect St.	Northampton	Mass.	
2.					
3.					

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St. & No.	City/Town	State	Tel. No.
Mr. Leon Murray, Supt. of Water Division	237 Prospect St.	Northampton	Mass.	

4. DATA:

No. of Pictures Taken None. Sketches See description of Dam.

Plans, Where In office files of Northampton BPW, Water Div.

5. DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor ____.
2. Moderate ____.
3. Severe X.
4. Disastrous ____.

Comments: Approx. 750 million gallons impoundment - would overtop lower reservoir and at least 10 homes and 5 highway bridges would be affected.

*This rating may change as land use changes (future development).

6. OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: Easterly end of dam - concrete overflow chute spillway- 66' wide x 5' high with 32' high conc. apee dropwall.

Controls None, TYPE: _____

Automatic _____. Manual _____. Operative Yes _____, No _____.

Comments: Minor spalling of face of dropwall.

No. 2 Location and Type: 66' northerly of dike - conc. gate house - 2 ea. 20" dia. ductile iron pipes.

Controls yes, Type: Screw lift gate valves.

Automatic _____. Manual X. Operative Yes X, No _____.

Comments: Controls operable per word of Water Div. personnel. One of these pipes is a feed pipe to lower reservoir.

No. 3 Location and Type: 50'± north of gatehouse - 20" dia. low intake pipe.

Controls Yes, Type: Screw lift gate valve.

Automatic _____. Manual X. Operative Yes X, No _____.

Comments: Operable per Water Division personnel.

Drawdown present Yes X, No _____. Operative Yes X, No _____.
Comments: See No. 3 above.

7. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 45' to 50'.

Material: Turf _____. Brush & Trees _____. Rock fill ____. Masonry ____. Wood ____.

Other Stone paved slope.

Condition: 1. Good X. 3. Major Repairs _____.

2. Minor Repairs _____. 4. Urgent Repairs _____.

Comments: _____

8. DAM DOWNSTREAM FACE: Slope 2:1 variable.

Material: Turf X. Brush & Trees ____. Rock Fill _____. Masonry _____. Wood _____.

Other _____.

Condition: 1. Good _____. 3. Major Repairs _____.

2. Minor Repairs X. 4. Urgent Repairs _____.

Comments: 5 each animal burrows noted, seepage flows at toe of slope, erosion of overflow spillway channel bed noted at lower end.

EMERGENCY SPILLWAY: Available yes Needed ____.

Height Above Normal Water 0 Ft. water level at time of inspection.

Width 66 Ft. Height 5 Ft. Material concrete.

Condition: 1. Good X. 3. Major Repairs ____.

2. Minor Repairs ____. 4. Urgent Repairs ____.

Comments: Wingwall cracks and face of dropwall have been repaired since last inspection of 11/29/33. Structure appears good at present time.

WATER LEVEL AT TIME OF INSPECTION: 5 Ft. Above ____. Below X.

Top Dam X F.L. Principal Spillway ____.

Other ____.

Normal Freeboard 5 Ft. to top of dam.

SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment None found

Animal Burrows and Washouts 5 woodchuck holes found on downstream slope.

Damage to Slopes or Top of Dam See burrows above - some areas of sparse turf cover.

Cracked or Damaged Masonry Minor surface cracks in repaired area of wingwalls.

Evidence of Seepage Several seepage flows noted in stone paved toe of slope.

Evidence of Piping None found

Leaks None found

Erosion Erosion of lower end of spillway runoff channel bed noted.

Trash and/or Debris Impeding Flow None found

Clogged or Blocked Spillway None found

Other ____

12. OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

13. REMARKS AND RECOMMENDATIONS: (Fully Explain)

Mr. Craig Nehring, work crew foreman of the Northampton Water Dept., was present during this inspection and all problems noted in report were discussed with him.

Several animal burrows were noted in the downstream slope and toe of slope. Erosion of spillway channal bed at lower end of outlet is becoming more noticeable. This area is rough paved with boulders which are becoming misplaced by water action but do not appear to pose any problem to safety of dam at present.

The settlement cracks between wingwalls and abutment walls of overflow spillway noted in last inspection have been repaired as has the face of spillway dropwall. The wingwalls appear to have stabilized now and only hairline cracks were noted.

Considerable seepage flows were noted in the stone paving or riprap along toe of dam but how much of this is surface storm water draining off was difficult to determine. The seepage drainpipe outletting on the westerly toe of slope had a strong flow of water emerging and a small amount of fines deposits were noted in brook bed directly below outlet end of pipe.

It would seem advisable for the Water Dept. to maintain a log of this seepage flow as a reference check for any possible unwarranted future increase in flow which would be indicative of a problem in the dam's structure.

At the present time this dam appears to be safe.

HTS/fc

December 21, 1973

Leon Murray, Superintendent
Water Division
Board of Public Works
237 Prospect Street
Northampton, Massachusetts 01060

Re: Inspection-Dam # 2-6-337-3
Whately
Northampton's Whately
Reservoir-Upper Dam

Dear Mr. Murray:

On November 29, 1973, an engineer from the Massachusetts Department of Public Works inspected the above dam, owned by the City of Northampton.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

1. The upstream wingwalls of the chute spillway are cracked away from the abutment joints by as much as 3/4 of an inch at the top surface, with the possibility that the northerly ends may have settled slightly.
2. A crack in the face of the spillway dropwall, about 6 feet above the floor, with wetness of the surface indicates continuous seepage.

The above conditions should be investigated and repaired as necessary. We call these conditions to your attention now, before they become serious and more expensive to correct.

Very truly yours,

Fred C. Schwerm

FRED. C. SCHWERM
Deputy Chief Engineer

LPA:moy
cc: F.J. HOEY
R. SALLS

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

~~City~~/Town Whately. County Franklin. Dam No. 2-6-337-3.

Name of Dam Northampton's West Whately Reservoir - Upper.

Topo Sheet No. 11A. Coordinates: Mass. Rect. N 527,600, E 279,900.

Inspected by: Harold T. Shumway, On Nov. 29, 1973. Date Last Inspection 1970.

2. OWNER/S: As of November, 1972

per: Assessors X, Reg. of Deeds ____, Prev. Insp. ____, Per. Contact X.

	Name	St. & No.	City/Town	State	Tel. No.
1.	City of Northampton, Board of Public Works, Water Division	237 Prospect Street	Northampton	Ma.	01060
2.					
3.					

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name	St. & No.	City/Town	State	Tel. No.
Leon Murray, Superintendent of Water Division	237 Prospect Street	Northampton	Ma.	01060

3. DATA:

No. of Pictures Taken None. Sketches See description of Dam.
Plans, Where In Water Division Offices.

4. DEGREE OF HAZARD: (if dam should fail completely)*

1. Minor ____. 3. Severe X.

2. Moderate ____. 4. Disastrous ____.

Comments: At least 10 homes and 5 bridges would be affected.

*This rating may change as land use changes (future development).

6. OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: Easterly end dam - concrete overflow chute spillway - 66' W. x 5' H. with 32' H. concrete ogee dropwall.

Controls No, TYPE: _____.

Automatic____. Manual____. Operative Yes____, No____.

Comments: This is an emergency overflow spillway.

No. 2 Location and Type: 66' northerly of dike - concrete gatehouse.

Controls X, Type: 2 - 20" M.J. ductile iron pipes with screw lift gate valves.

Automatic____. Manual X. Operative Yes X, No____.

Comments: One of these pipes is a feed pipe to lower reservoir.

No. 3 Location and Type: 50'± north of gatehouse - low intake pipe - 20" dia.

Controls X, Type: Screw lift gate valve.

Automatic____. Manual X. Operative Yes X, No____.

Comments: _____.

Drawdown present Yes X, No____. Operative Yes X, No____.
Comments: See No. 3 above.

---

7. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 45' to 50'.

Material: Turf____. Brush & Trees____. Rock fill____. Masonry____. Wood____.

Other Stone paving.

Condition: 1. Good X. 3. Major Repairs____.

2. Minor Repairs____. 4. Urgent Repairs____.

Comments: Stone paving appears stable - concrete gatehouse appears sound.

---

8. DAM DOWNSTREAM FACE: Slope 2:1 variable.

Material: Turf X. Brush & Trees____. Rock Fill____. Masonry____. Wood____.

Other _____.

Condition: 1. Good____. 3. Major Repairs____.

2. Minor Repairs X. 4. Urgent Repairs____.

Comments: Strong seepage noted at toe of slope in area of 20" dia. pipe feeding lower reservoir. Also two animal burrows noted.

9. EMERGENCY SPILLWAY: Available Yes. Needed _____.

Height Above Normal Water 7 Ft. Water level at time of inspection

Width 66 Ft. Height 5 Ft. Material Concrete.

Condition: 1. Good _____. 3. Major Repairs _____.

2. Minor Repairs X. 4. Urgent Repairs _____.

Comments: Both upstream wingwalls have cracked at union with spillway abutment and appear to have settled - pulling away from abutment about 3/4 of an inch at top level.

10. WATER LEVEL AT TIME OF INSPECTION: 12 Ft. Above _____. Below X.

Top Dam X F.L. Principal Spillway _____.

Other _____.

Normal Freeboard 5 Ft.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment None.

Animal Burrows and Washouts Yes. Two animal burrows on downstream slope.

Damage to Slopes or Top of Dam None except animal burrows.

Cracked or Damaged Masonry East spillway abut wingwall cracked - minute cracks in spillway dropwall.

Evidence of Seepage Yes. Heavy seepage at toe of slope in area of 20" dia. feed pipe to lower reservoir. Some seepage noted through concrete spillway dropwall.

Evidence of Piping _____.

Leaks None Noted.

Erosion Minor erosion if spillway runoff channel.

Trash and/or Debris Impeding Flow None.

Clogged or Blocked Spillway None.

Other _____.

(12.) OVERALL CONDITION:

1. Safe_____.
2. Minor repairs needed X.
3. Conditionally safe - major repairs needed_____.
4. Unsafe_____.
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list_____.

(13.) REMARKS AND RECOMMENDATIONS: (Fully Explain)

This is a relatively new dam - built in 1970. The grade and alignment of earthen dike, which has a two foot wide concrete core to within two feet of top is good. The stone paved upstream slope appears stable. The downstream slope is well turfed over and appears stable. On westerly end of dike, it was noted that downstream slope had eroded from surface water and had been stone riprapped to prevent further erosion.

Both of upstream wingwalls of chute spillway were cracked away from abutment joints from $\frac{1}{2}$ to 3/4 of an inch at top surface. It would appear that northerly ends of walls may have settled slightly. A crack was noted in face of spillway dropwall about 6 feet above floor level. There was a wetness of surface around area of this crack indicating continuous seepage. Minor erosion of spillway drain channel floor was noted at lower end.

Heavy seepage of water coming through toe of slope in area of outlet end of 20" pipe feeding lower reservoir was noted. However, this toe of slope is riprapped with large rock and water seepage could be local surface drainage rather than water from dam.

RCS/js /sd

Number 230-A

2-6-337-3

TOWN WHATELY

Name Northampton Reservoir #2 Inspection Date 1970

Owner City of Northampton

Location Just upstream of #230

Type of Pond

Acreage

Drainage Area

Comments

Type of Dam

Length

Height

Head of Water

Comments

Type of Spillway

Width

Height

Comments

Condition, Previous Report, Dated

Present Condition Being constructed

DISTRICT II.

Submitted by Harold T. Shumway Dam No. 2-6-337-3

Date November 29, 1973 ~~City~~/Town Whately

Name of Dam Northampton's West Whately Reservoir - Upper

Location: Topo Sheet No. 11A Mass. Rect. Coordinates N 527,600 E 279,900

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

On West Brook in West Whately just above Lower Reservoir, Number 2-6-337-2, or about 3/10 mile on Conway Road from Williamsburg Road intersection and just west of Conway Road.

2.

Year built 1970 Year/s of subsequent repairs -

Purpose of Dam: Water Supply X Recreational _____

Flood Control _____ Irrigation _____ Other _____

4.

Drainage Area: 8½ sq. mi. _____ acres.

Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban _____ Rural, Farm _____

Wood & Scrub Land X Slope: Steep 50% Med. 50% Slight _____.

Normal Ponding Area: 82± Acres; Ave. Depth 28 1/10 29'

Impoundment: 750 million gals.; 2296 acre ft.

Silted in: Yes _____ No X Approx. Amount Storage Area _____

No. and type of dwellings located adjacent to pond or reservoir _____

i.e. summer homes etc. None

7.

Dimensions of Dam: Length 870'± Max. Height 60'±

12' at time of inspection to top dike

Freeboard 5' when reservoir full

Slopes: Upstream Face 2:1

Downstream Face 2:1 variable

Width across top 20'±

Dam No. 2-6-337-3

Classification of Dam by Material:

Earth	Core Wall Conc. Masonry	Stone Masonry	Timber	Rockfill	Other
X	X				Stone paved slope upstream

Dam Type: Gravity X Straight X Curved, Arched _____ Other _____

Overflow _____ Non-overflow X

A. Description of present land usage downstream of dam:

100 % rural; _____ % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure? Yes _____ No X

C. Character Downstream Valley: Narrow X Wide _____ Developed rural homes

Rural 100% Urban _____

Risk to life and property in event of complete failure.

No. of people 10

No. of homes 10

No. of businesses None

No. of industries None Type _____

No. of utilities 3 Type Water, telephone and electric transmission lines. Northampton Water Works.

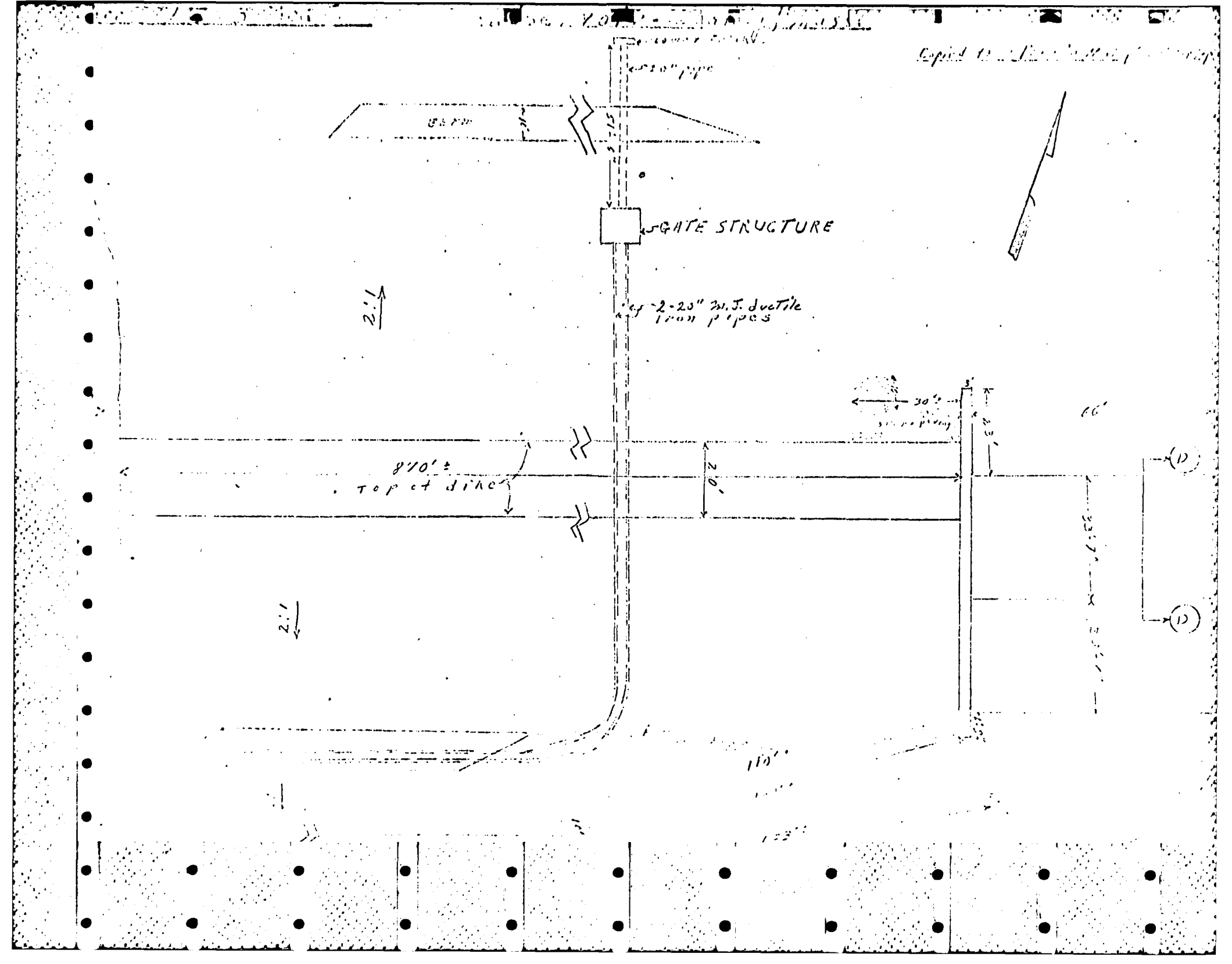
Railroads None

Other dams Northampton's West Whately Reservoir - Lower Dam, No. 2-6-337-2
2 - E. S. Crafts Dam, No. 2-6-337-1

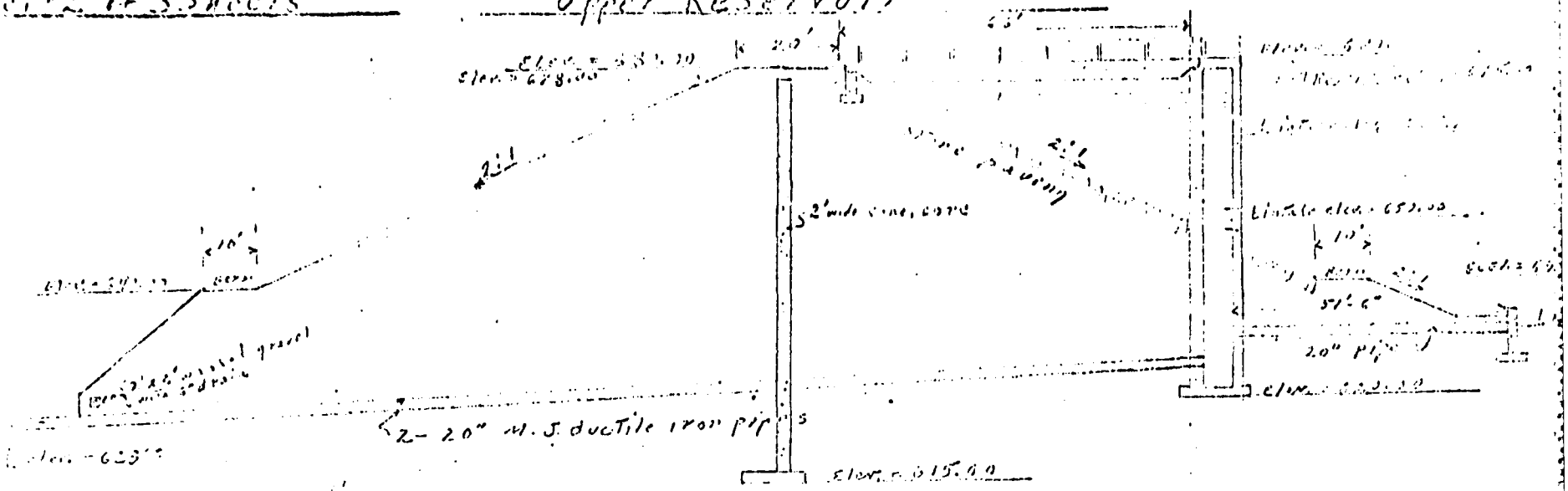
Other 5 Town Highway Bridges and 3 Town Highways.

Attach Sketch of dam to this form showing section and plan on 8½" x 11" sheet.

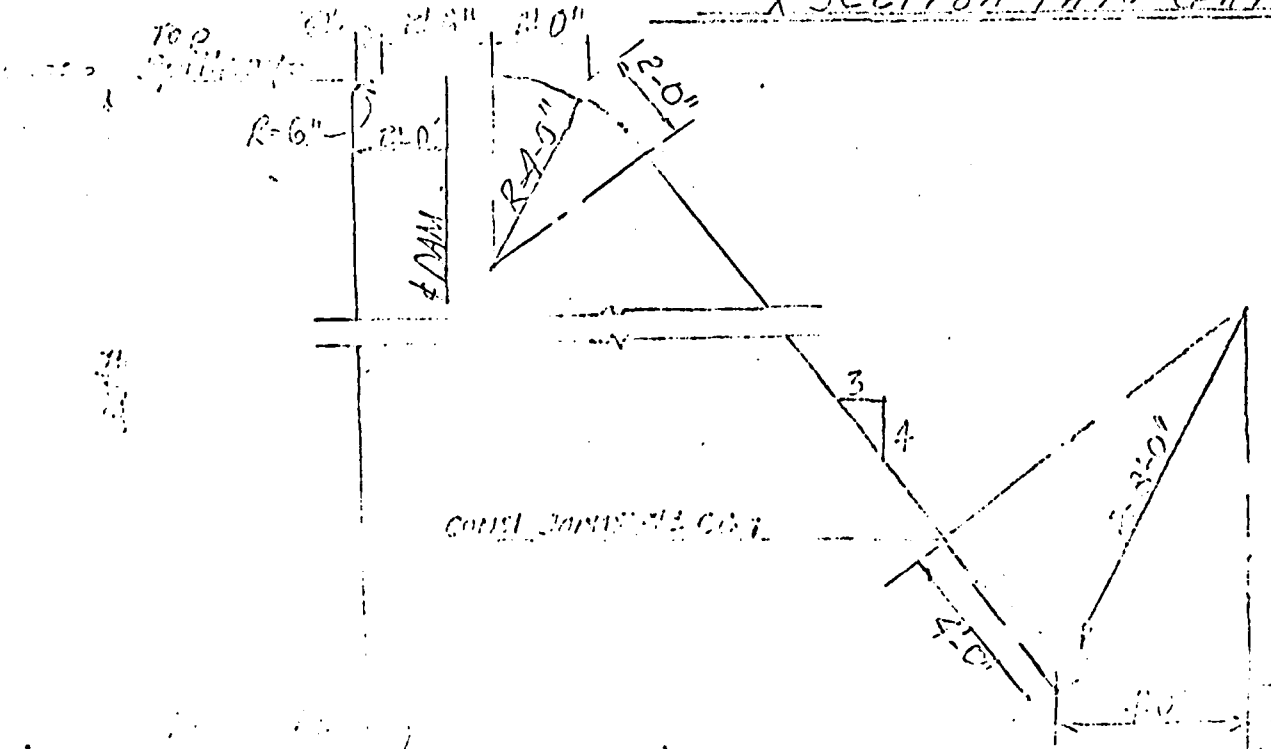
CS/vk/sd
tachments
Locus Plan
Sketches

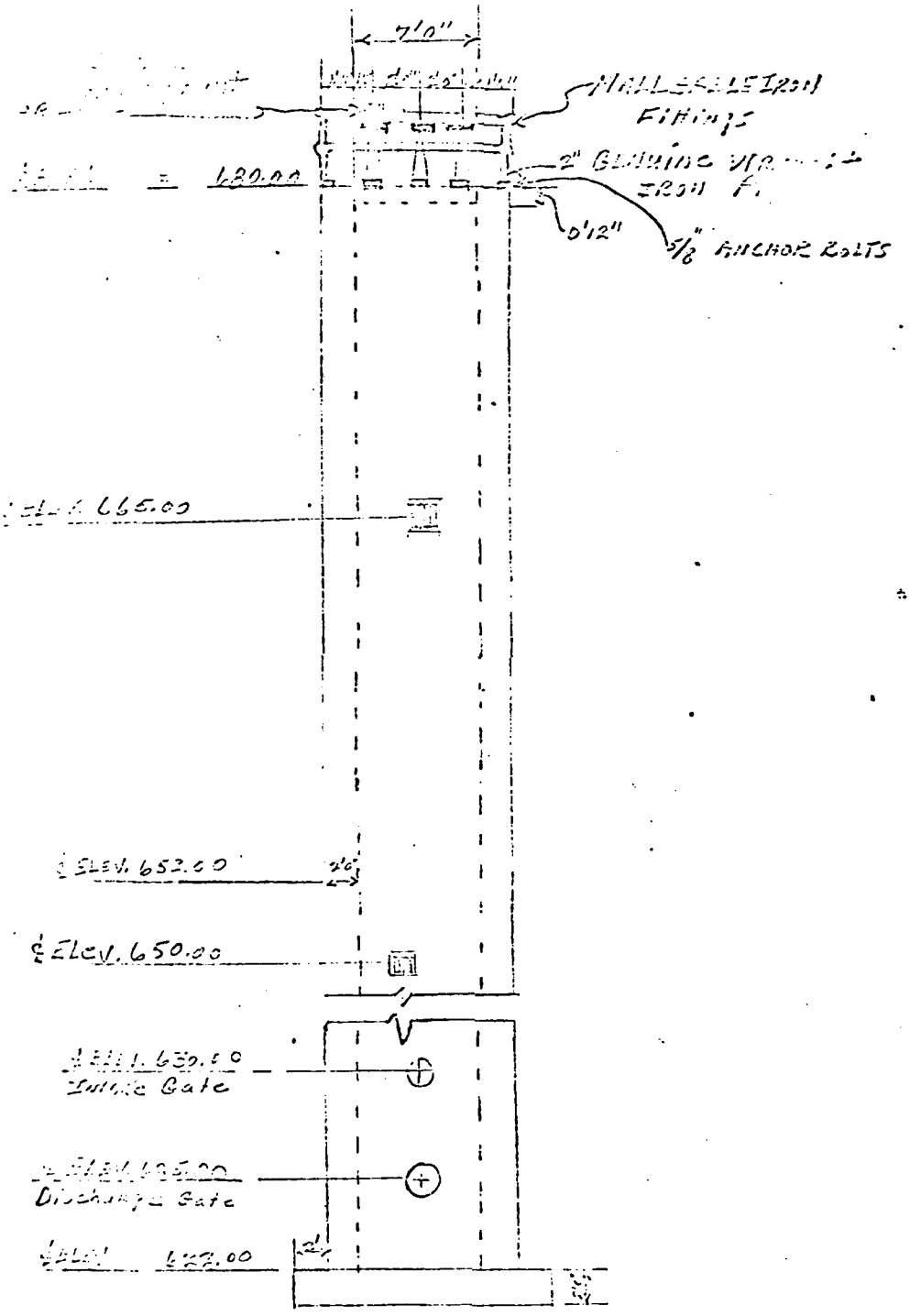

GATE STRUCTURE
2-20" M.J. ductile iron pipes
2:1
2:1
8'10" ± top of dike
30'
110'

Upper Reservoir

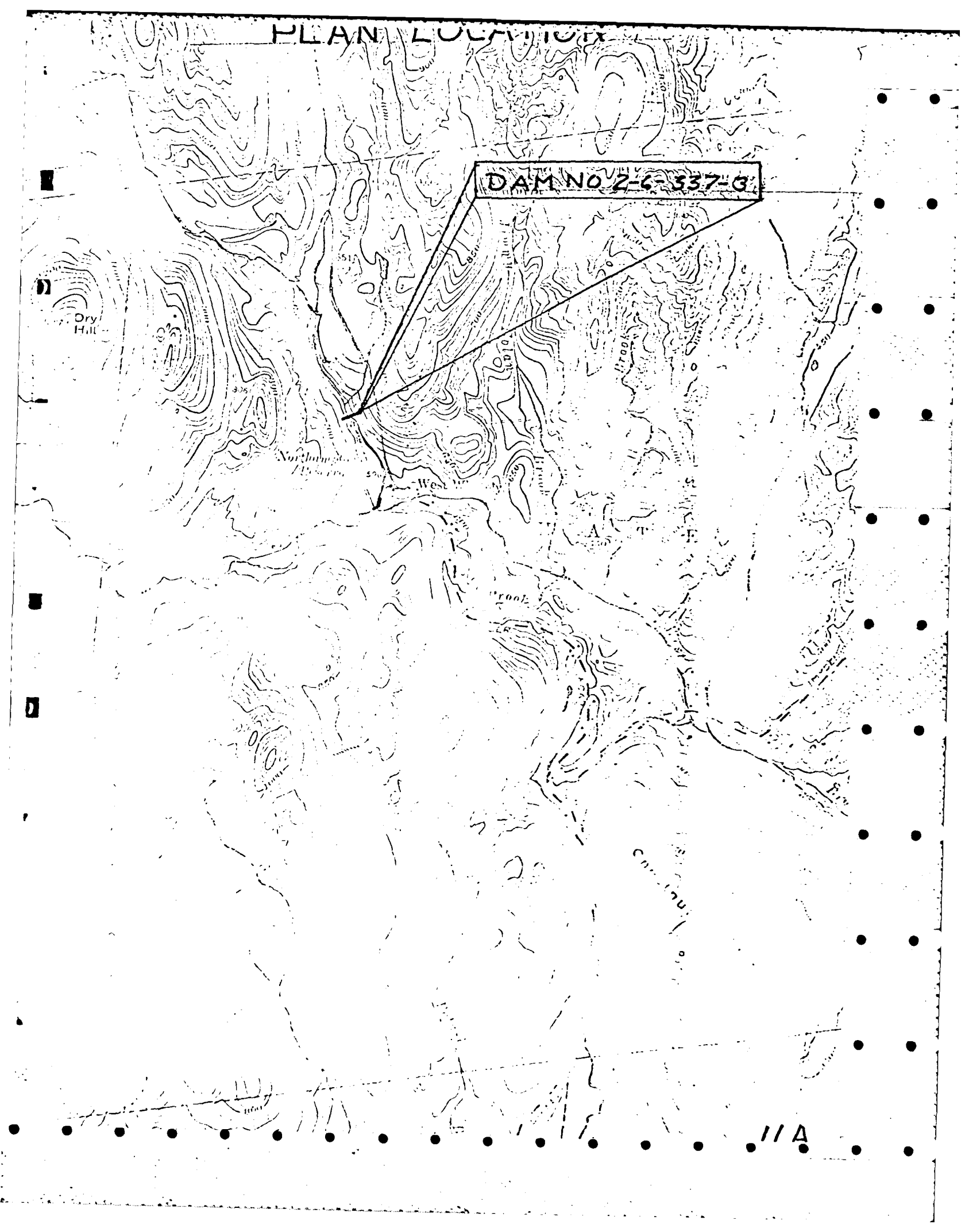


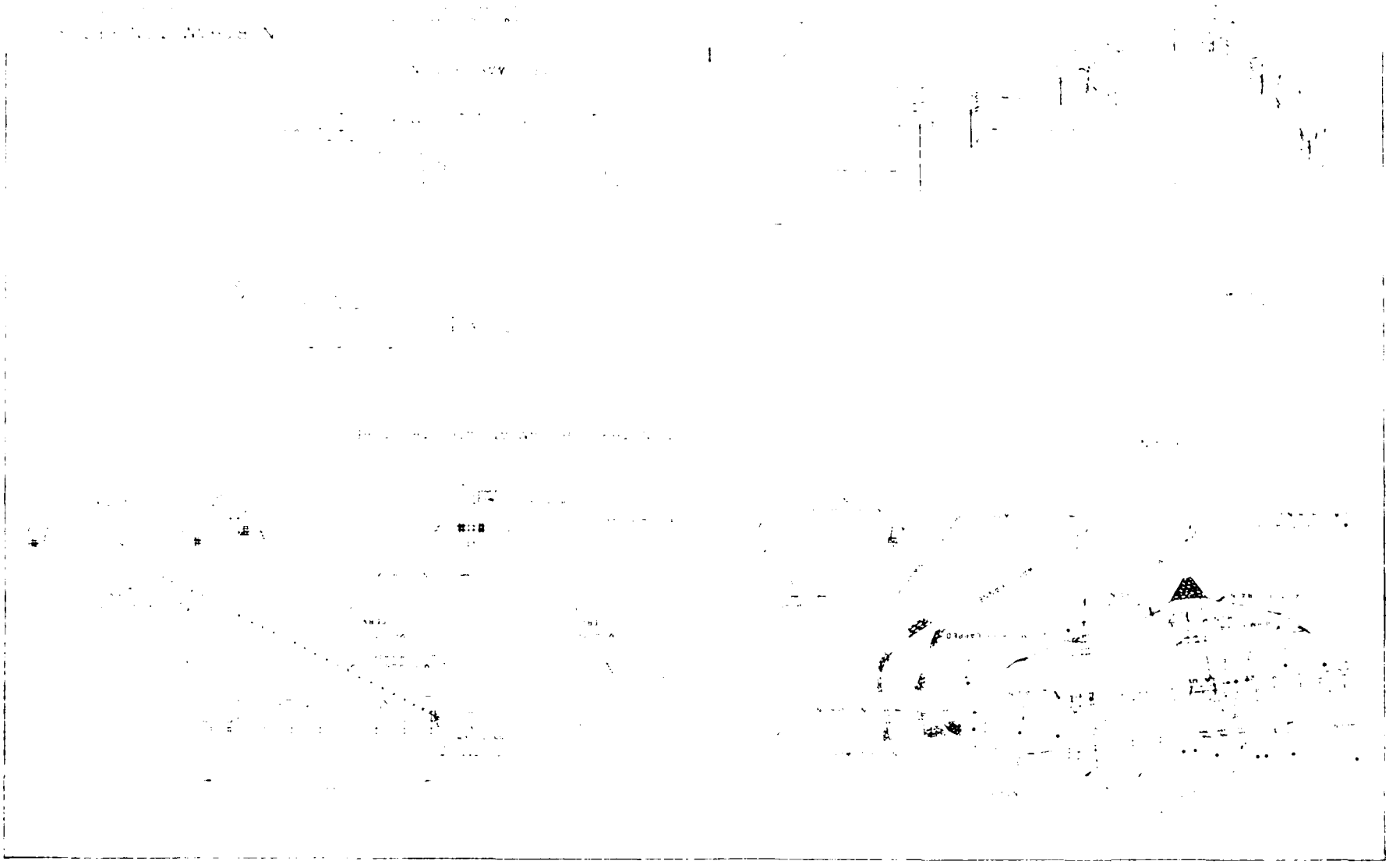
X-SECTION THRU GATE HOUSE





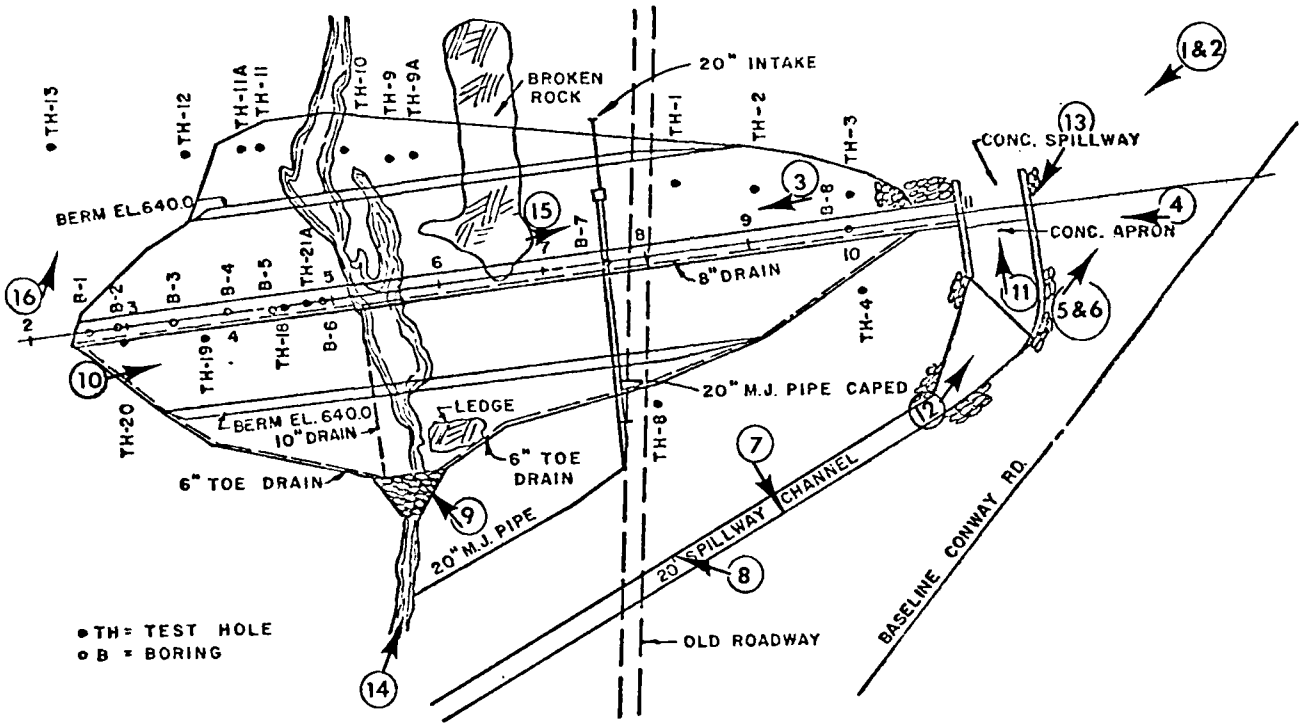
Gate Structure (Front Elevation)


PLAN LOCATION
DAM NO. 2-C-337-G
Dry Hill



APPENDIX C

PHOTOGRAPHS



PLAN

LOCATION OF PHOTOGRAPHS
NORTHAMPTON RESERVOIR
UPPER DAM
IN
WHATELY MA.

NOT TO SCALE JULY 1978

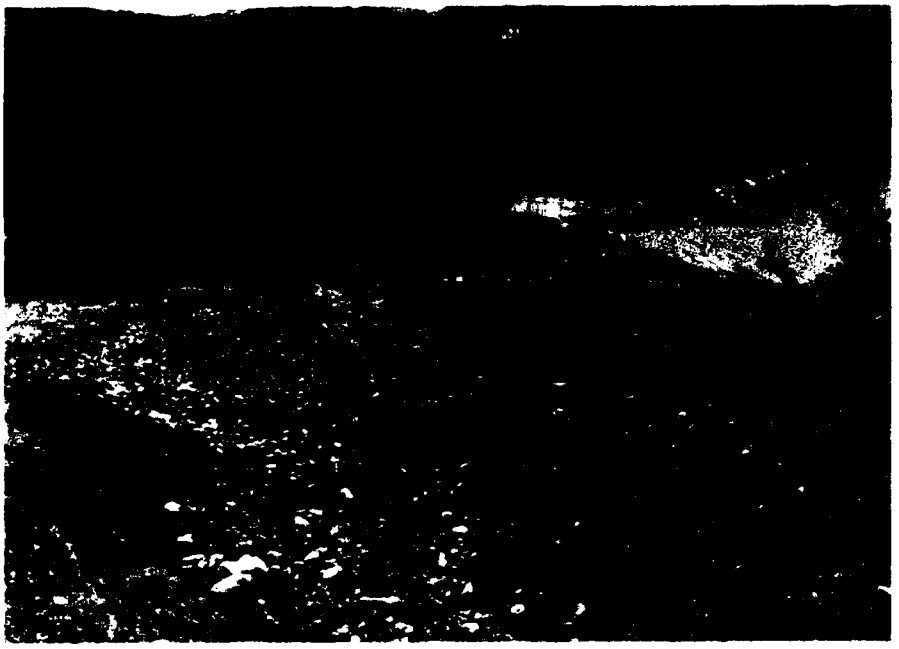


PHOTO NO. 1 - Close-up of surface erosion shown in Photo 2.

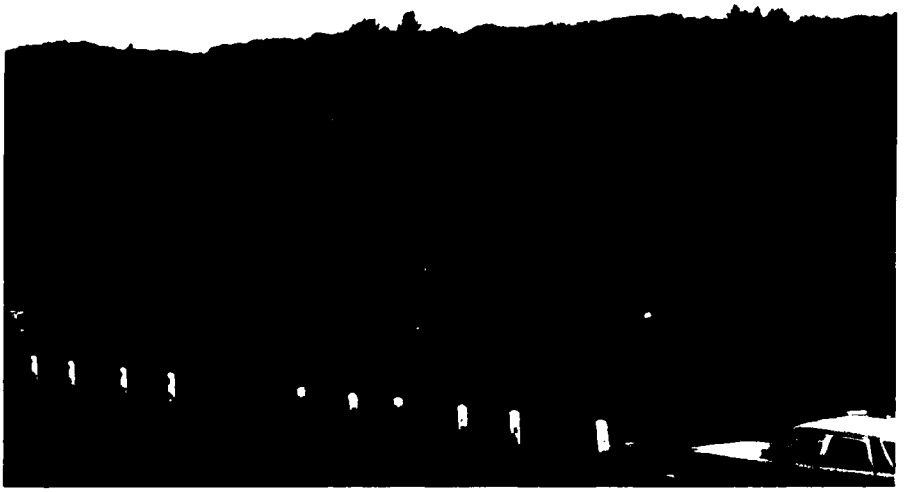


PHOTO NO. 2 - General view of surface erosion on left abutment along contact between u.s. face and abutment.

PHOTO NO. 3 - Upstream face showing riprap stopping about 3 ft. below crest of dam.

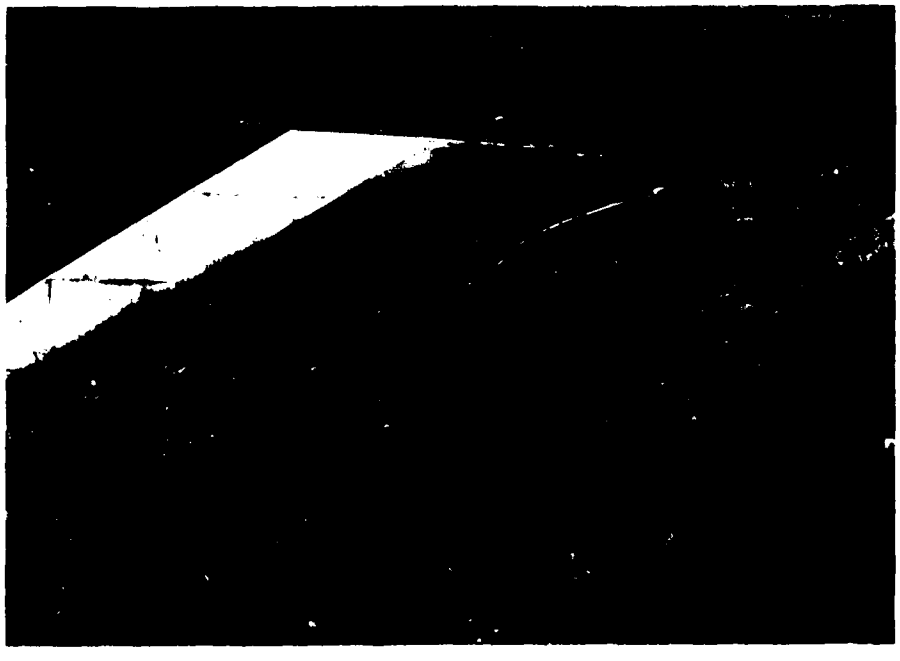


PHOTO NO. 4 - Area of surface slumping on d.s. face of dam near left abutment.

PHOTO NO. 5 - Channel of surface erosion on left abutment at contact of d.s. face and abutment.

PHOTO NO. 6 - Close-up of surface erosion channel shown in Photo 5.

PHOTO NO. 7 - Slide on left bank of spillway channel.

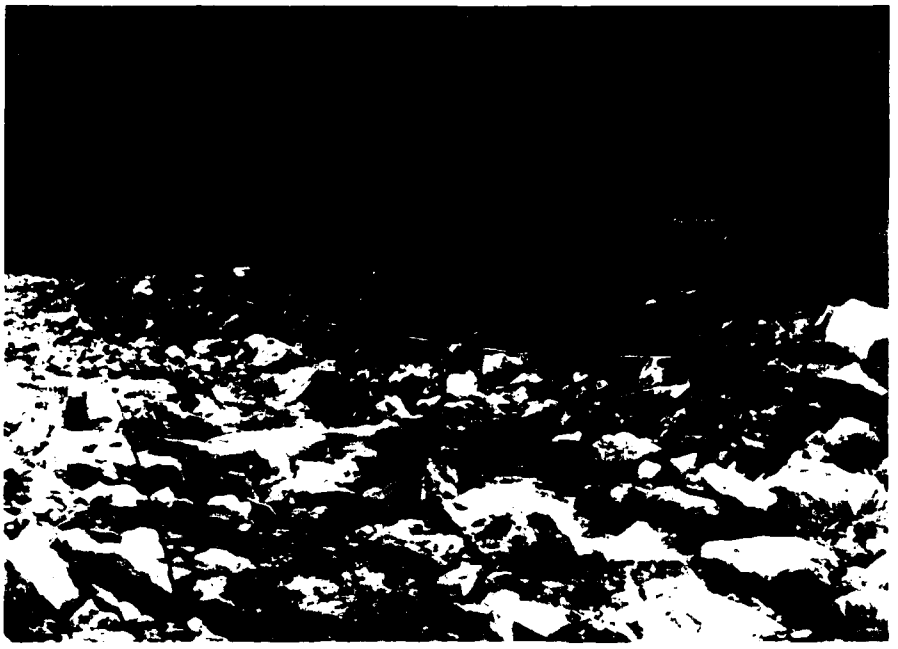


PHOTO NO. 8 - Slide on right bank of spillway channel.

PHOTO NO. 9 - Outlets of toe drains.

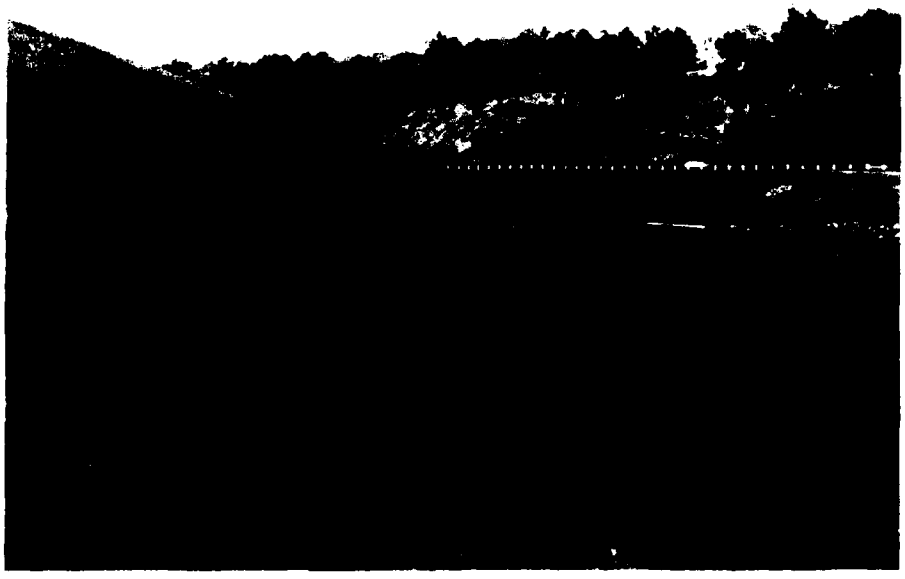


PHOTO NO. 10 - General view of d.s. slope from area of right abutment.

PHOTO NO. 11 - General view of spillway.

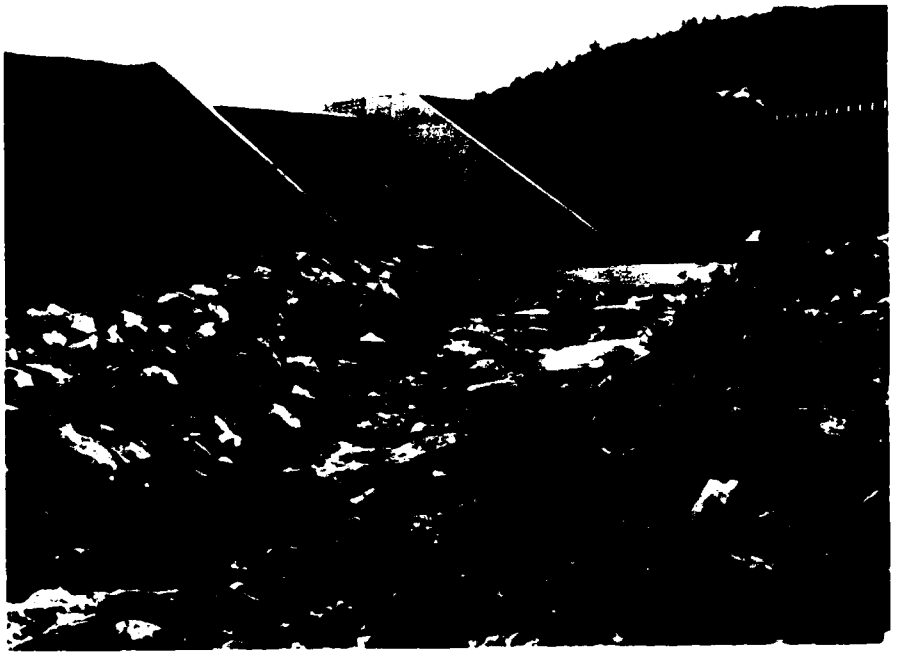


PHOTO NO. 12 - General view of spillway and outlet channel.

PHOTO NO. 13 - Spall where u.s. spillway wall abuts spillway.

PHOTO NO. 14 - Outlet pipe at lower reservoir.

PHOTO NO. 15 - Intake structure and Service Bridge.

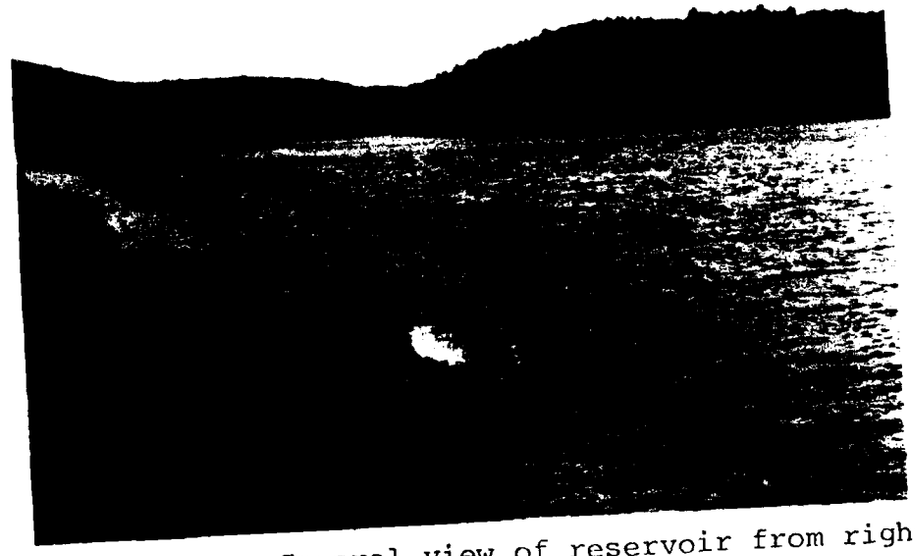


PHOTO NO. 16 - General view of reservoir from right abutment.

APPENDIX D

1. HYDROLOGIC COMPUTATION
2. DRAINAGE AREA

Phase I

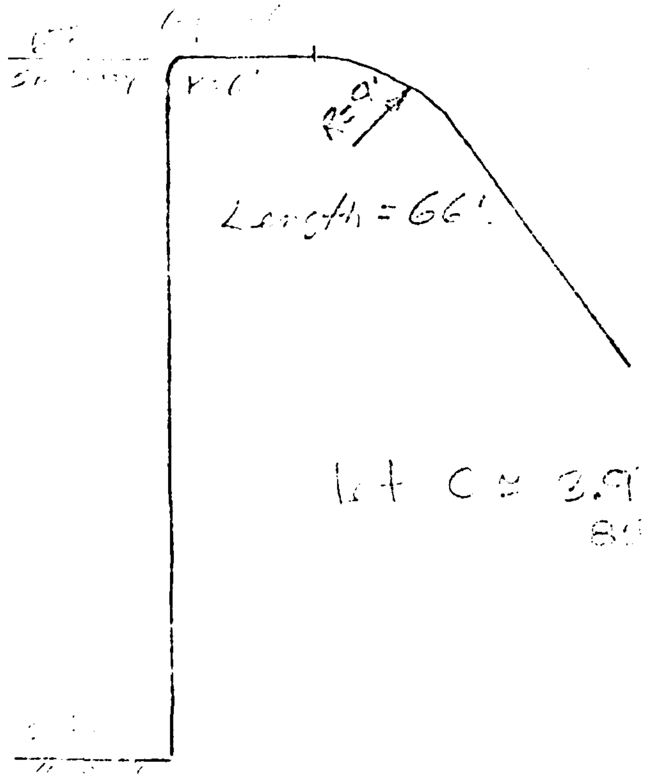
Storage Normal 2296 a-f
Max 2700 a-f
Height Struct. 65'
hyd. 60'
Size - intermediate
Hazard - high

Design Chk PMF Whitman - Howard

Drainage Area 2897 a or 4.53 sq mi

Rolling to [illegible] Area 1875 cfs/s.mi.

Q_p = Flow = 1875 × 4.53 = 8,500 cfs



$Q = CLH^{3/2}$

let C ≈ 3.9 (King)

$8500 = 3.9(66)(H)^{3/2}$

$H^{3/2} = 33.023$

H = 10.3 ft.

NO [illegible]

OUT [illegible]

Capacity [illegible]

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BOSTON, MASSACHUSETTS

18,11'
BY FDE

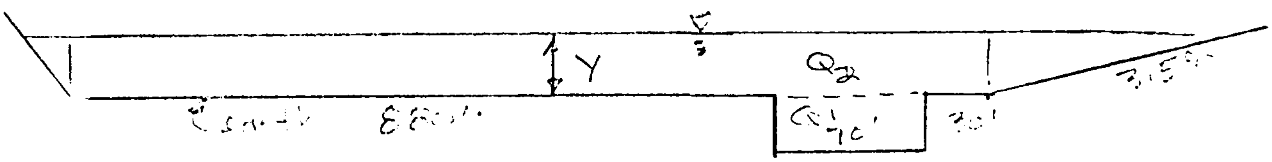
SHEET NO. 21
JOB
SUBJECT Northampton
CLIENT Corps

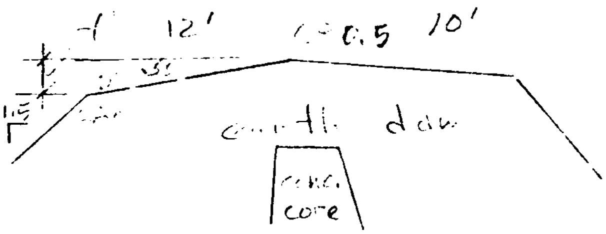
Northampton - upper

Floodway Capacity

$Q_1 = 3.? (60)(5.5)^{3/2} = 3,320 \text{ cfs}$

Q_2 = remainder overflowing dam 8500 − 3320 = 5180 cfs





$\frac{0.5}{12} = \frac{x}{100}$ x = 4.17%
say 4%

$S = 0.04'/1'$

$Q = VA \quad V = \frac{1.486}{n} R^{2/3} S^{1/2}$

a let Y = 2' wP = 2.5 + 880 + 30 + 60 = 975'
A = 980 x 2 + $\frac{10}{2}$ x 2 + 60 x $\frac{2}{2}$ = 2295'

R = 2.26 1.78'

$V = \frac{1.486}{0.04} (1.78)(.2) = 13.23$ fps

Q = 13.13 (2295) = 30,?? >> 5180

b let y = 1' wp = 940' A = 980 + 2.5 + 150 = 1133 sf.
R = 1.205 $R^{2/3}$ = 1.13

$V = \frac{1.49}{.04} (1.13)(.2) = 8.42$ fps

Q = 8.42(1133) = 9540 cfs > 5180.

let Y = 0.75 wp ≈ 935 A = 11?? ?? = 933
R = .99? $R^{2/3}$ = .998
$V = \frac{1.49}{.04} (.998)(.2) = 7.42$

Q = 7.42 (933) ≈ 6922 > 5180

let El. ≈ 681.35' for ? ?

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SHEET NO. 21
JOB Dams
SUBJECT Northampton Flood
CLIENT Corps

A_{max} ≅ 57.71 − 56.31 = 1.40 sq mi 1296'

$A_{100\,yr}$ ≅ 58.69 − 57.72 = .97 sq mi 891.1'

A_{cum} = 57.38 − 56.52 = 0.86 791'

Elev 630: 59.01 − 58.97 = .04
Elev 620: 59.04 − 58.44 = .60
Elev 610: .34 − .33 = .01

Δn = 37.5 / 20' or a/Ft ≅ 2.

El.	Qin	Q	D	Qc	a-f	d-f
Elev	cfs					d-f sum
650	0.09	3.7	30.	7.5	71	72
620	0.6	52.	20.	29.4	588.	660.
680	.97	89.1	30.	72	1160	2820.
(+0.2)		90.	0.2	81.5	18	2838.
(+1.5)		91.	0.3	90.5	27	2865.
(+10)	1.4	129.	—	—	—	
615 (100 a-f)		79.	6.25	85.0	531 (675−532)	1191

@ 675 1100 sq-ft.

T_{storm} = 531 a-f × 12 ÷ 2897 = 2.20" runoff

$Q_{2.20}$ = 8500 × $\left(1 - \frac{.8842}{2.20}\right)^{1.29}$ = .1157 ≅ 7,500. cfs

A_{max} − 3320 = 4,180.

$Y = .5'$ $a_{.5'}$ = 920' $r = .5(730) = 365$ sf

$k = .54$ $k^{1/3} = .66$

$V = \frac{1.49}{.03}(.66)(.2) = 4.9$ fps

$Q = 4.9\,(495) = 2428 \cong \frac{1}{2}$ (4 acres)

$Y \cong 0.5'$ @ El. 681.0

675.0	79	—	—	
661.0	85	6'	82.0	492

Σ = 492 c.f.s

$\frac{492 + 541}{2}$ = 517± cf or 2.142"

$Q_{f.} = 850 \times \left(1 - \frac{2.142}{10}\right)^{.8873} = 7542.$ cfs

$Q_{f.}$ "flow over top of dam = 7542 cfs"

due to over topping, estimate dam failure

Time of time of failure = 2865 c.f.s
Bottom elev. of base of dam 600.00'
" " crest of weir 740.'
C_d = .4(740) = 300'
y_o = 81.35'

$Q_f = \frac{8}{27}(300)\sqrt{32.2}\,(81.35)^{3/2} = 541{,}800$ cfs

$\frac{541{,}800}{453{,}000}$

At low dam Q_{max} = 354 cfs
+ 754
1,900± cfs
for spillway = -2055
5,355 cfs

For this Q = 50± @ 4.00'
[illegible] = .36 c.f.s ±

$Q = \frac{8}{27}(32.2)\sqrt{32.2}\,(y)^{3/2} = 8{,}000$ cfs

Y	A	V	Q
1'	12	11	132
2	48	11	528
4	192	7.6	1,459
4	192	7.6	1,459

[illegible] y = 3'±

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BOSTON MASSACHUSETTS

JOB
SUBJECT
CLIENT

Storage in Pond

620 — 63.90 − 63.52 = 0.38 avg .365 — 32,520 a

56[illegible] — 65.53 − 63.48 = .05 — 4.6 a

610 — 54.00 − 53.72 = .28

600 — 53.77 − 53.57 = 0.20

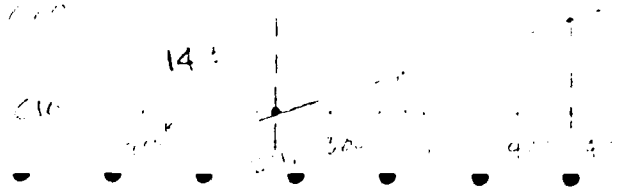
	A	D	Δ	
580	[illegible]	[illegible]	[illegible]	[illegible]
590	18,3[illegible]	[illegible]	11,5[illegible]	[illegible]
610	25,7[illegible]	10	22,1[illegible]	73,0[illegible]
[illegible]	33,5[illegible]	[illegible]	29,6[illegible]	[illegible]
620.5	34,[illegible]	0.5	33,75[illegible]	17,[illegible]

[illegible] A·D ∠ ½ (3000) [illegible]

$$Q_{P2} = 453800 \left(1 - \frac{.746}{3000}\right) = 338{,}535 \text{ cfs}$$

Storage for Q_{P2} Use elev 614 Vol = 488 ± a-f

1st Y = 40' [illegible] 610
W_P = 11,0[illegible] + 100 = 1210
A = 10,3[illegible] + 5800 = 16,100
R = 13.2 5.66
V = 14.8[illegible] = 16.83
Q = 271,000 cfs < 338,



JOB NO. 7[illegible]

DATE [illegible]

BY [illegible]

CH'D BY [illegible]

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SHEET NO

JOB [illegible]

SUBJECT [illegible]

CLIENT [illegible]

Total flow due to both dams [illegible]

$Q = 453,800$ cfs

Final section 600' below lower dam

$S = \frac{10'}{250} = 4\% \pm$ or $0.04'/'$

$n = 0.10$

$L + y = 20'$ also 590

$w_p = 850'$

$A = 30(10' \times 20') = 6[illegible]$ sf

$R = 7.06' \quad 3.7'$

$V = \frac{1.46'}{.10}(3.7)(.2) = 11'$ fps

$Q = 6[illegible],972$ cfs $\neq$ 453,800 NG ✓

[illegible] $y = 30'$ [illegible]

[illegible] $87 + 26 = 1110'$

$A = 6[illegible] + 6((10)+15(100) = 10[illegible]$

$R = 9.3' \quad 4.4'$

$V = 14.2(2.9)(.2) = 12.12$[illegible]

$Q = 135,181$ cfs $\neq$ [illegible]

[illegible] $y = 50'$ [illegible] 620

$w_p = 1110 + 200 = 1310'$

$A = 10300 + 21(40') = 21900$

$R = 16.7' \quad 6.6'$

$V = 14.8(6.6)(.2) = 19.6'$

$Q = 429,554 \neq 453,800.$

[illegible] 621

$w_p = 1320$

$A =$ [illegible] ✓

$R = 17.5$[illegible]

$V = 14.8(6.5)(.2) =$ [illegible]

$Q =$ [illegible] 429,264 cfs [illegible]

[illegible] Δ [illegible] $\pm$

$Vol_{Ave} = \frac{485 + 763}{2} = 561$ a-f

$Q_{P_2} = 453800\left(1 - \frac{.711\ 615}{3000}\right) = 359{,}000$ cfs

Sta 264+00 — At elev 620.5

Next Section 4,600' below old dam

$S = \frac{570.4 - 565}{4600'} = \frac{12.6}{4600} = 3\% = 0.03'/'$ ave

$n = 0.10$ — $Q_{in} = 253{,}400$ cfs

1- $Y = 9.7'$ elev 470
a_p 510'
A = 3464 + 136 = 3600 s.f.
P = 23.8'
V = 1.49 (1.2)(.1730) = 21 fps
Q = 253. > 254

1-A $Y = 4.7'$ elev 475
a_p = 540
A = 1345 + 25(9 x 20) = 1,795 s.f.
P = 29.54'
r = 29.8 s.f.
Q = 400,500 cfs

488'

C640 below lowest dam

$Q_{100} = 259,000$ cfs

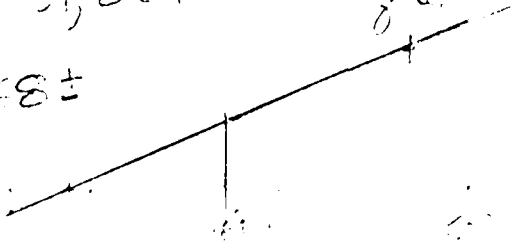
$S = \frac{570-512}{2600} = \frac{58}{2600} = 2.23' / 0.0223'/'$

1st $Y = 42'$ elev 550

$WP = 415'$
$A = 23(400) = 9200$ sf
$R = 22.17 \quad 7.97$
$V = 14.3 \sqrt{(7.97)(.1492)} = 17.69$
$Q = 162,711$ cfs < 369 mgd

1st $Y = 52'$ elev 560
$WP = 455'$
$A = 9200 + 2(2)(2) = 12400$
$R = 27.25 \quad 9.46$
$V = 21.397$
$Q = 286732 <$ mgd

1st $Y = 62$ elev 570
$WP = 495$
$A = 13400 + 24(20) = 18200$
$R = 36.77 \quad 11.19$
$V = 24.83$
$Q = 451,869 >$ mgd



568±

elev 568
$A = (18200 - 13400)(8) =$
17240

$\frac{1}{2}(3000.) =$

$Q_{in} = 359{,}000 \times \left(1 - \frac{.69\ 922}{3000}\right) = 248{,}000 \pm$ cfs

for $Q = 248{,}000$ cfs $\simeq 558 \pm$

$A \simeq 13400 - 400 = 13000$ sf

$Vol \simeq \frac{13000 + 2720}{2} \times \frac{20\text{hrs}}{43560} = 832 \pm$ af

$Q_{out} = 359{,}000 \left(1 - \frac{.706\ 881}{3000}\right) = 253{,}454 \pm$ cfs

$Q_{OUT} = 253{,}400$ cfs or 568.0

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JOB Dams
SUBJECT [illegible]
CLIENT Corps

Sta 46+00

$$Q_{P2} = 253,400 \left(1 - \frac{708}{3000}\right) = 194,000 \text{ cfs}$$

.7640 .2051

$$Vol_1 = \frac{17740 + 13600}{2} \times \frac{200'}{43560} = 708 \text{ a-f}$$

elev 485 A = 13600 − 23 (200) = 9000

$$Q_{P3} = 253,400 \left(1 - \frac{\frac{708+519}{2}}{3000}\right) = 201,453\pm \text{ cfs}$$

.795

$$Vol = \frac{9000 + 13600}{2}\left(\frac{2000}{43560}\right) = 519 \text{ a-f}$$

Qout 201,400 cfs @ elev 488±

to 66+00 Qin = 201,400 cfs±

Stream 405±

$$S = \frac{450 - 405}{2000} = 2.25\% \text{ or } 0.0225 \text{ '/'}$$

Try Y = 40' elev 445

width 600'
A = 39(400) = 15600
R = 26 8.87
V = 1.49 (8.87)^{2/3}(.15)^{1/2} = 19.77 fps
Q = 308401 > reqd

Let Y = 30' el. 435

width 550'
A = [illegible] (200) = 19[illegible]
R = 18.6[illegible] [illegible]
[illegible] 15.5
[illegible]

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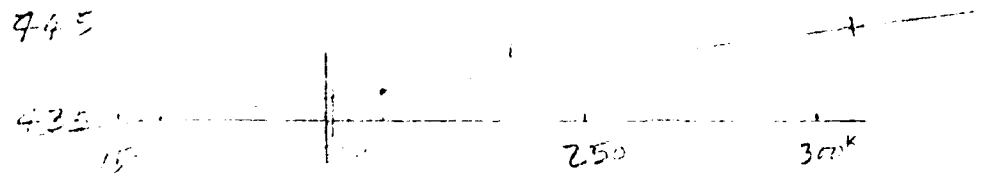
SHEET NO. 11 -
JOB Dam 3
SUBJECT Flow thru TP-C
CLIENT Corps

66+00



d_{cr} = 438' ; Q = 201,400. cfs

A_1 = 15000 - 28(125+1) = 12,100 sf.

$V_{c1} = \frac{12100 + 13600}{2}\left(\frac{20''}{43560}\right)$ = 590' o-f

$Q_2 = 201,400\left(1 - \frac{590'}{3000'}\right)^{.803}$ = 161,700.± cfs

d_{cr} = 437.5 ±

A_2 = 11,400. sf

$V_{c2} = \frac{11400 + 13600}{2}(.00459)$ = 574. o-f

$V_a = (574 + 590) \times \frac{1}{2}$ = 582 o-f

$Q_2 = 201,400.\left(1 - \frac{582}{3000}\right)^{.806}$ = 162,300.± cfs

Elev 438.

JOB NO. 16 177
DATE 6-16
BY MK
CH'D BY

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BOSTON, MASSACHUSETTS

SHEET NO 12
JOB
SUBJECT
CLIENT Corps

Sta 79+00 Q_{in} = 162,300 cfs

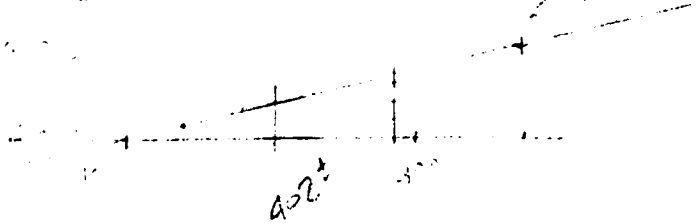
elev 375

$S = \frac{415.375}{1200} = \frac{30}{1300} = 2.3\%$ 0.023'

lot Y = 90' elev 415
L_i = 1,110
w/p = 970'
A = 51 (410) = 22,800 sf
r = 23.5' 8.20'
v = 19.8 + (8.79)(1.510) = 19.68
Q = 97,963. > req'd

lot Y = 25' elev 405
w/p = 870
A = 11,200 − 30(15 × 20) = 11,100 sf
r = 12.76 5.51'
V = 12.4
Q = 137,698' > req'd

lot Y = 30 elev 405
w/p = 900
A = 11100 + 30 = 15,000
r = 16.67 6.59'
V = 14.04
Q = 227,000 > req'd



elev 402

$A = 12720 \pm$

$V = \frac{12720 + 12100}{2}\left(\frac{13000}{43560}\right) = 370$ a-f

$Q_{in} = 162300\left(1 - \frac{370}{3000}\right)^{.877} = 142{,}400.$ cfs

elev 401

$A = 13860 - 2.5(38 \times 7) = 11{,}960$

$V = \frac{12100 + 11960}{2}\left(\frac{13000}{43560}\right) = 359$ a-f

$V_{avg} = \frac{359 + 370}{2} = 365$ a-f

$Q_{out} = 162{,}300\left(1 - \frac{365}{3000}\right)^{.8014} = 142{,}564.$ cfs

Possible damage to 15 houses + 9 other structures

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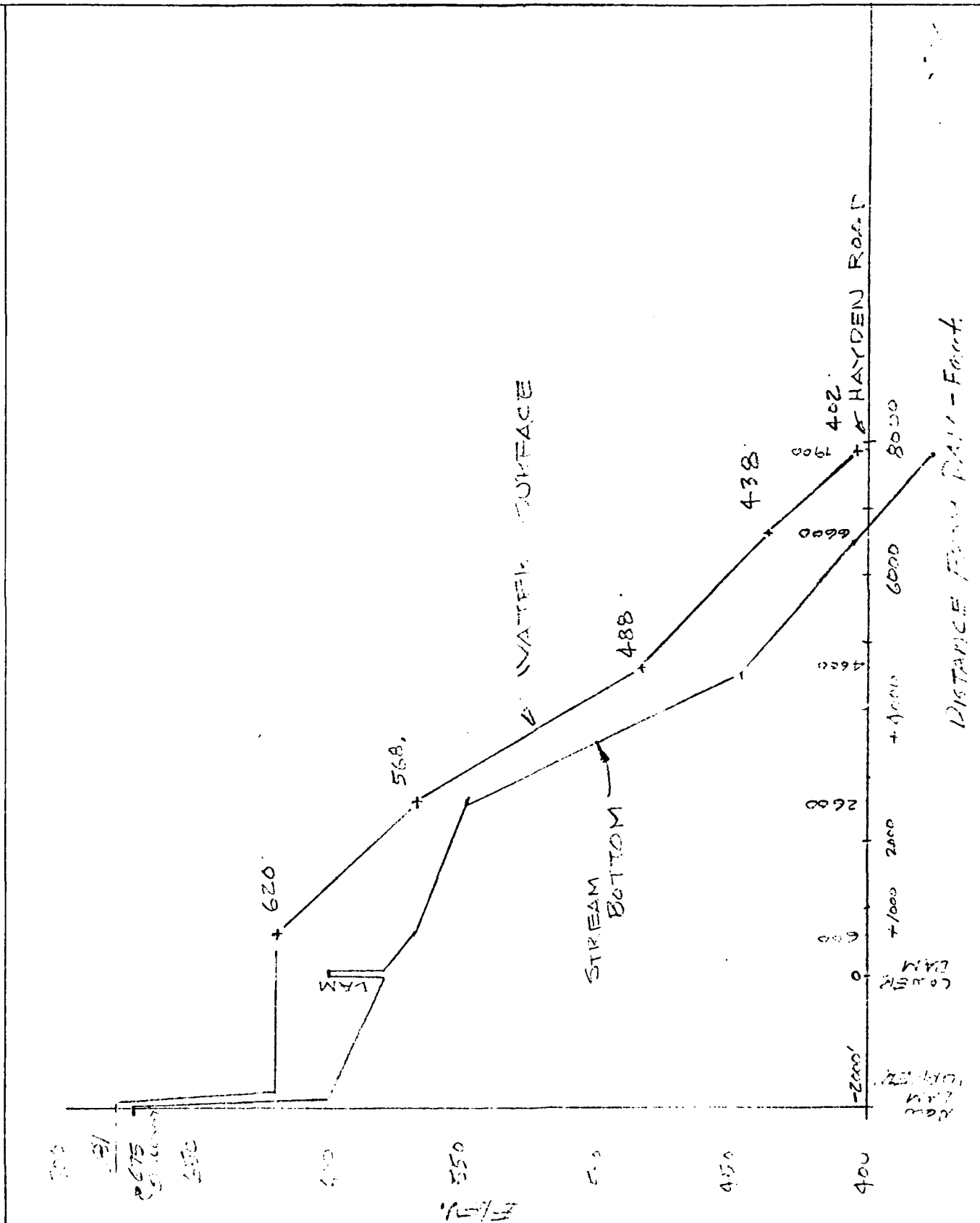
BOSTON, MASSACHUSETTS

SHEET NO. 17
JOB Low Inspection
SUBJECT Navigation - Ohio
CLIENT Corps

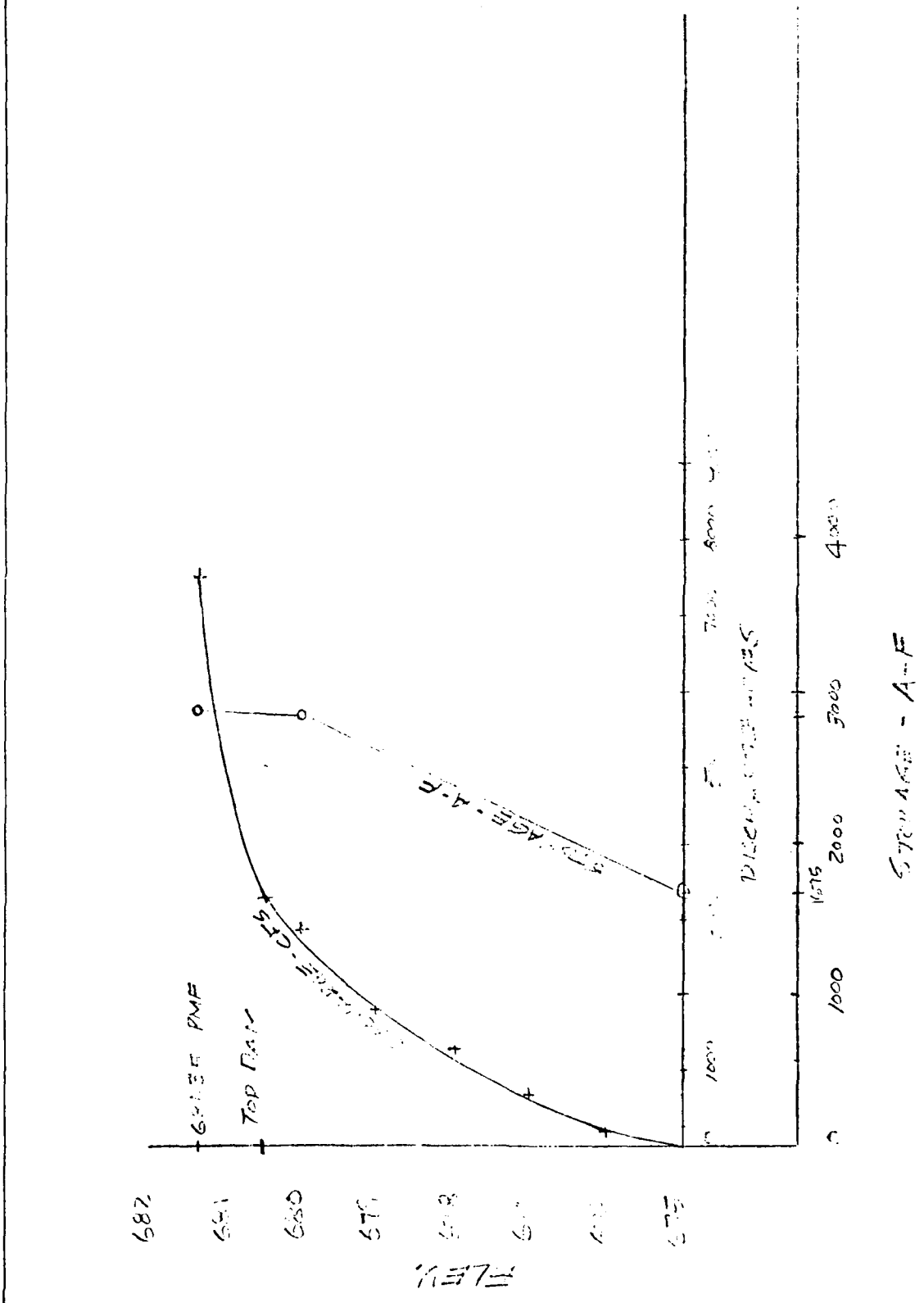


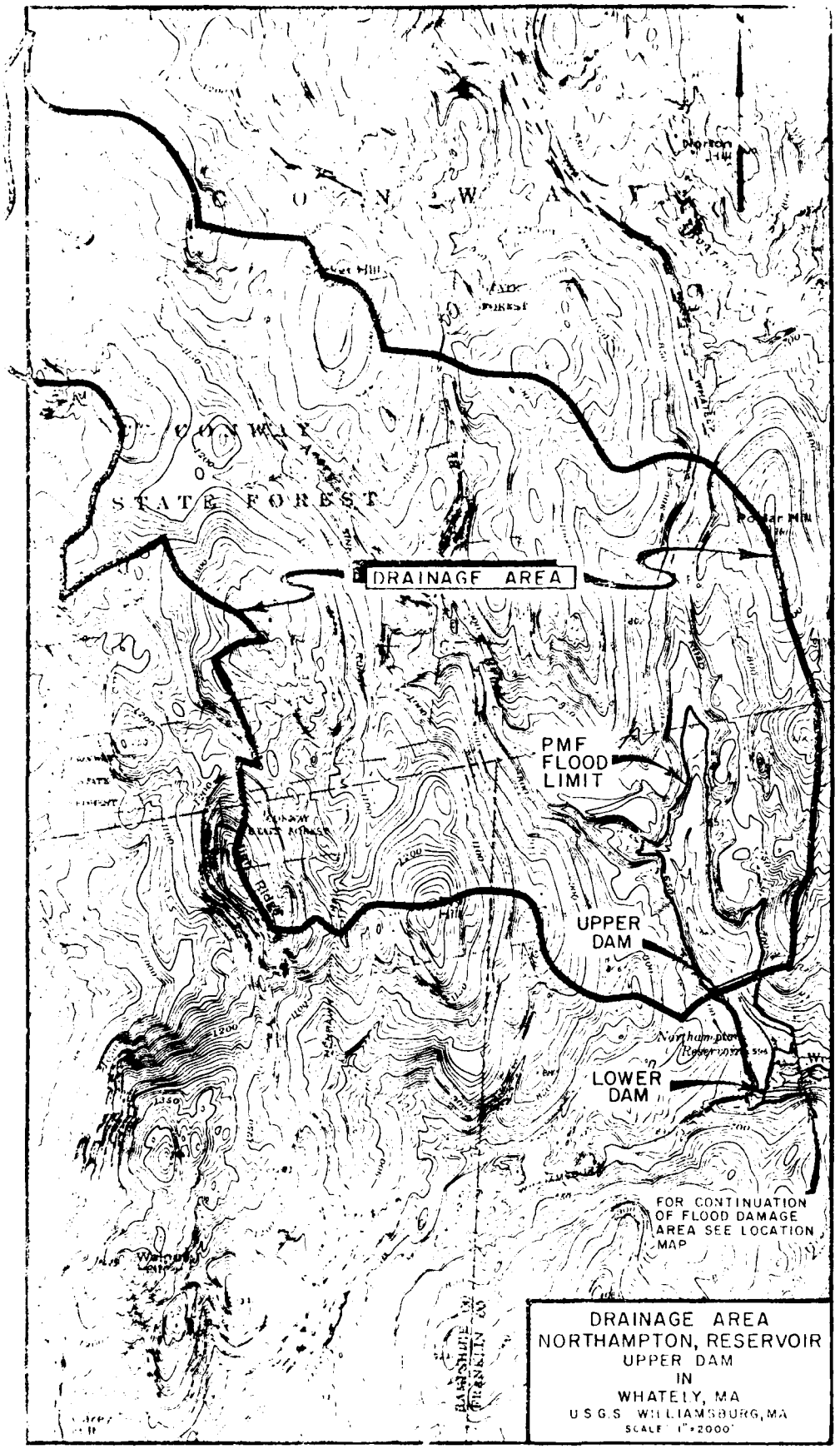
JOB NO. 76-17
DATE /
BY
CH'D BY TDD

HH&B HAYDEN, HARDING & BUCHANAN, INC
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO 1
JOB
SUBJECT
CLIENT

STAGE - STORAGE - DISCHARGE





APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE COUNTY	CONGR DIST	STATE	COUNTY	CONGR DIST	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
MA	521	NED	MA 011	01				NORTHAMPTON RESERVOIR UPPER DAM	4226.5	7241.2	24JUL78

POPULAR NAME	NAME OF IMPOUNDMENT
WEST WHATELY UPPER	NORTHAMPTON RESERVOIR UPPER

REGION BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 08	WEST BROOK	WHATELY	2	1145

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
RECTPG	1970	S	90	80	2620	2460	NED	N	N	N	N	24JUL78

REMARKS

DAMS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	940	U	66	3320												

OWNER	ENGINEERING BY	CONSTRUCTION BY
CITY OF NORTHAMPTON	WHITMAN AND HOWARD, INC.	

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
HAYDEN, HARDING + BUCHANAN INC.	26MAY76	PL 92-367

REMARKS

END

FILMED

7-85

DTIC